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Tuberculosis of the Female Genitalia and Peritoneum

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TUBERCULOSIS OF THE FEMALE GENITALIA AND PERITONEUM.

PRESIDENT'S ADDRESS BEFORE THE CHICAGO SURGICAL SOCIETY, OCTOBER 19, 1903.

JOHN B. MURPHY, A.M., M.D.
CHICAGO.

Members and Gentlemen:—I have chosen as the subject of my presidential address, "Tuberculosis of the Female Genitalia and Peritoneum." This subject, it seems to me, can be best considered by first taking a broad view of the affection, and then taking up its manifestations on the different segments of the genital tract.

INTRODUCTION.

I. HISTORICAL.

The history of tuberculosis of the female genitalia dates back to 1744, when Morgagni, making a necropsy on a young woman who had died from tuberculous peritonitis, found the uterus and both fallopian tubes filled with caseous material. The tubes and ovaries were firmly adherent, so that it was impossible to separate them, and Morgagni considered the lesions as being the primary focus of the disease. Similar observations were reported by Louis and by Senn of Geneva later on.

In 1831 Reynaud gave a description of two cases of uterine tuberculosis found in tuberculous patients. Lesions of the tubes were figured by Cruveilhier, and tuberculosis of the uterus described by Kiwisch and Paulsen. Up to this time genital tuberculosis had been considered merely as a pathologic curiosity, and of no clinical interest (Virchow and Rokitansky).

Brouardel in 1865 in a thesis corrected the early information on the subject and gave a good account of the gross pathology. Koch's discovery of the specific germ of tuberculosis aroused fresh interest in the subject, which was increased by Babes finding the tubercle bacilli in the vaginal secretions, and by the publication in 1886, of Hegar's exhaustive and classic contribution of the pathogenesis, diagnosis and surgical treatment of the condition. We owe to Cohnheim and Verneuil (1883) the suggestion that coition might be the starting point of the tubercular localization.

During the last fifteen years many contributions to this subject have been published, prominent among them being papers by Stolper, Schöttlander, Wolff and Polano. The pathologic anatomy has been studied especially by Cornil. Monprofit, Franck, Wolff and Schöttlander.

II. FREQUENCY.

Tuberculosis of the female genitals has received but little attention, if one considers the ubiquity of tubercular diseases in general. Some idea of its frequency can be gained from the following statistics:

Nimias and Christoforis found 1 case in every 12 necropsies on tuberculous women.
Schramm found 1 case in 34 cases.
Posner found 1 case in 35 cases.
Mosler found 1 case in 40 cases.
Kiwisch found 1 case in 40 cases.
Cornil found 1 case in every 50 to 60 cases.

Merletti, in 6,000 necropsies at Parma, found that tuberculosis was the cause of death in 1,360. In 205 of these the genitals were involved; in males 34 (2.41 per cent.), in females 172 (12.6 per cent.).

Hansemann (cited by Veit), however, in 7,000 necropsies at the Friedrichshain Hospital, Berlin, found 450 cases of tuberculosis in women (6.5 per cent.). In only 18 of these (4 per cent.) were the genitals involved.

Frerichs gives the per cent. of primary tuberculosis of the female genitals at 6; Mosler, 19.5; Spaeth, 24.5.

According to Amann, in males 3 per cent. of tubercular lesions involve the genital organs; in females, 20 per cent. According to Still, 9.5 per cent. of tuberculous girls under 12 years of age have genital tuberculosis.

Senn (Geneva) in performing nearly 2,000 laparotomies for various indications, found tuberculosis of the female genital organs 19 or 20 times.

Out of 1,600 pieces of tissues from the gynecologic clinic in Griefswald which were examined for tubercle bacilli, they were found in 24 (Martin).

III. ETIOLOGY AND PATHOGENY.

Genital tuberculosis may be either primary or secondary. By the former we understand that the focus in the genital apparatus is the only one in the body. In favor of primary genital tuberculosis are the facts that:

(*a*) Otherwise strong, healthy people have primary manifestations in the genitalia.

(*b*) After the removal of the local genital focus, patients remain well for years.

(*c*) Children otherwise apparently healthy have primary tuberculosis manifested only in the external genitalia.

The primary form is less frequent than the secondary. Some authors (Scanzoni, Klebs) absolutely deny the possibility of this form; others (Lebert) consider it to be very rare. On the other hand, Schramm, in his 34 cases of genital tuberculosis, found 1 primary. Spaeth, in 119 cases, found 27 primary (24.5 per cent.). Mosler, in 46 cases, found 9 primary (19.5 per cent.), while in 15 cases noted by Frerichs, 1 was primary.

The secondary form is frequent in phthisis. Thus D. Turner met it in 5 out of 27 necropsies on cases of chronic phthisis at the Brompton Hospital. In 7 more there was catarrhal salpingitis, the tubes looked suspicious, but no naked-eye appearances of tuberculosis were found. Stolper, in 34 necropsies on women dying from pulmonary tuberculosis, found tubercular lesions of the genitalia in 7 (20.5 per cent.).

We owe to Hegar the theory of two forms of genital tuberculosis in the female—an ascending, which is generally primary, and a descending, which is generally secondary. For the production of the primary, the two following possibilities must be taken into account, according to Hegar: (1) Penetration of germs from the outside directly to the mucosa of the vagina, uterus, tubes and finally the peritoneum and ovary. (2) Penetration of germs through minute breaches of continuity in the genital canal, into the lymphatics, thence to the fallopian tubes directly against the lymph current as we see it in the neck occasionally, or by way of the pelvic peritoneum into the tubes at the fimbria.

Amann remarks that, in addition, the cryptogenous forms (those in which the genitalia are the only localization of long latent tuberculosis, or in which the bacilli, penetrating the blood stream or lymph current, cause lesions of the genital tract alone) may be considered primary.

The sources of bacilli in the production of genital tuberculosis in general may be classified as hematogenous, lymphatic, contiguity of tissue and continuity of surface.

Bouilly, in a communication to Amann, gives as his opinion that infection is most often of hematogenous origin; he himself does not know of any case of direct contagion.

According to Kleinhans there are three arguments in favor of infection by means of the blood current:

(1) The existence of tuberculosis in the genitals following tuberculosis of the lungs, with no intermediate foci.

(2) The frequent localization of tuberculosis on the site of the placental attachment.

(3) The transmissibility of the bacilli from the mother to the fetus.

To these Veit adds the sudden eruption of acute general miliary tuberculosis, which has been many times noticed to succeed the existence of a markedly circumscribed focus.

Voigt, however, calls attention to a fact which in his opinion negatives transmission by the blood current, namely, the frequent occurrence of genital tuberculosis during the period of sexual activity. Hence, he is of the opinion that there is more reason to suspect direct ascending infection. (In my experience it is quite as common before puberty, but less frequently recognized.) Direct infection may occur from dirty instruments, bed linen and clothing, the accoucheur's or patient's fingers, and especially from coitus.

In 1882 Cohnheim asked if the semen of tuberculous individuals with absolutely healthy genitals may not contain the tubercle bacilli. A little later Verneuil declared that a tuberculous male with sound genitals is capable of transmitting tuberculosis by coitus. It is a question how he knew they were healthy, as it is very difficult to determine tuberculosis of the seminal vesicle. Verchere reported two cases of this kind, and Fernet made a systematic examination of the tuberculous patients who were under his care during a year's service. He communicated the results to the Hospital's Medical Society of Paris, and confined his remarks to cases where the genital tuberculosis was evidently or probably primary. With these limitations he found two in which it was evidently due to coitus with tuberculous men. Derville mentions three males who died of phthisis without involvement of the genitals, yet tubercle bacilli

were found in the semen; an analogous case is narrated by Foa.

In support of the direct transmission by coitus, I shall cite the following case which came under my observation:

Mrs. L., aged 32, whose husband had been treated by me for three years for tuberculosis; first, tubercular empyema, second, tubercular osteitis of the spine, and for eleven months preceding the appearance of Mrs. L., he had suffered with tubercular epididymitis, with tubercle bacilli in the semen and urine. Mrs. L.'s illness dates from four months previous, when she had her initial attack of pelvic peritonitis. She had recurrent attacks of this inflammation every three to six weeks, accompanied by severe pain, elevation of temperature, and great sensitiveness in the pelvic peritoneum. The tubes were enlarged and there was some fluid in the pelvic peritoneum. The uterus was not fixed; the fornices were not infiltrated, but there was a stiffness of the peritoneal folds. Diagnosis: Tuberculous peritonitis and tuberculosis of the tubes with no evidence of tuberculosis in any other portion of the body. Operation; section revealed enlarged tubercular tubes, both fimbriated ends patulous, with pronounced ectropion of the mucosa. Hard, caseous masses in each tube about three- quarters of an inch from the cornu of the uterus; these masses appeared to be the primary foci in the tubes. The cul-de-sac had confluent tubercular eruptions; as the distance from the fimbriated end increased, the number of tubercles on the peritoneum diminished. The peritoneum and intestines were free from tubercles above the promontory. The tubes were removed and the abdomen closed; complete recovery, and patient has remained well for the last nine years.

While this would appear as a direct transmission with only a genital and peritoneal involvement, I have seen so many cases of tuberculosis of the epididymis with tubercle bacilli in the urine and seminal discharge in married men without the wife becoming infected, that I must conclude that other conditions are necessary for the development of the tuberculosis in the female genital tract.

In some cases, notably that of D'Aubeau, the discovery of bacilli in the semen without any lesion of the genitals was the first evidence of unsuspected pulmonary tuberculosis. Curt Jani was unable to find

bacilli in the seminal fluid of tuberculous patients. Pursuing his investigations further, however, he found them in apparently healthy testes and prostates (6 out of 8 testes and 4 out of 6 prostates). This probably accounts for many of the erroneous diagnoses of tuberculosis of the bladder and testicle made on the basis of bacilli found in the urine.

Amann refers to Mammer's case as one of the most striking examples of this mode of infection. A woman of 35 died from general miliary tuberculosis four years after marriage; at the necropsy the only tubercular focus was a caseous fallopian tube; the uterus and vagina were not involved. The husband, who came from a tuberculous family, had both apices involved, although there was no trace of disease in the genitalia; he was accustomed to lubricate the parts with saliva to facilitate intromission.

Pfannenstiel and Merletti even report one case and Prochownik two of genital tuberculosis where the husbands had tuberculosis of the testicle. In Kehrer's case the patient died from a postpartum genital tuberculosis, and her husband died soon after from genital tuberculosis also.

Similar cases, in which the husband was tuberculous and the wife healthy, are described by Keppler, Strassman, Hofmeier, Rein, Von Franque, Menge, Pincus and 7 by Jacobs (Amann).

Experiments on animals have been undertaken by a number of observers, e. g., Landouzy and Martin took semen from a tuberculous patient whose testicles were apparently healthy. He does not state the condition of the seminal vesicles, and after diluting it with a ½ per cent. solution of sodium chlorid, injected it into the peritoneal cavity of 15 guinea-pigs. Five of the animals died from tuberculosis. Similar results were obtained by Sirena and Pernice and by Solles.

Maffucci, after injecting large doses of tubercular cultures into the saphenous vein of animals, found

tubercle bacilli in the testes and their secretion. Jaeckh introduced fragments of testes from tuberculous patients into guinea-pigs and rabbits, and, killing them in two to three months, found three out of five guinea-pigs tuberculous; the rabbits were not affected.

Gaertner made a series of experiments to see if bacilli would be transmitted from the parent to the fetus. After inoculating the testes of rabbits and guinea-pigs with tubercular material, he found that a number of females fecundated by these males became tuberculous, with marked lesions of the uterus and vagina. In 65 female guinea-pigs, 5 died from tuberculosis starting in the vagina; tubercles were found in the lungs, liver and spleen; the vagina was filled with yellow, caseous masses swarming with bacilli. Lymphatics infiltrated with tubercles were rare towards the peritoneum; of 59 rabbits but 9 presented the same appearances.

Spano examined the semen of seven individuals dying from tuberculosis (six in the lungs, one in the hip), microscopically as well as by cultures and inoculations. Negative results. In another series of 6, the results were positive. In 2 of these, bacilli were not found in the semen on microscopic examination, and inoculations into the peritoneum and in the vagina, after irrigation, were successful in 2 out of 3 animals.

Peraire injected pure cultures from the secretions of tubercular endometritis into the vaginæ of rabbits, and observed tubercular metritis and endometritis as a consequence. Cornil and Bobroklonsky also injected tubercular cultures into the vaginæ of guinea-pigs, taking great care not to wound the mucosa. The animals were killed after intervals of from four to thirty-two days, and in those killed after fifteen days tubercles were found in the uterus.

Oncarini, however, obtained negative results. This observer first produced lesions of the vagina in guinea-pigs by injecting tincture of iodin; then he introduced pieces of tissue from tubercular salpingitis. General

tuberculosis was produced in all the animals, but in none were genital lesions discovered. A pregnant female gave birth to a young one which died in three weeks from tuberculosis of lung, spleen and liver.

Popoff, in a series of experiments on guinea-pigs, divided the animals into three series. In the first series of eight, tubercle bacilli were simply deposited in the vagina without any traumatism; negative results. In the second series of four, the vaginal mucosa was wounded with a needle until hemorrhage ensued, and thirty minutes later cultures of tubercle bacilli were injected. Tubercular lesions ultimately developed at the points wounded. In the third series of four, trauma was produced by the injection of irritants (iodin, turpentine, etc.), and cultures injected 48 hours later. Tubercular lesions developed in the inguinal and retroperitoneal glands and the genital apparatus, but nowhere else. As a result of his experiments, this author concludes: (1) It is impossible to infect the genital organs unless there is some preceding trauma. (2) In cases of tuberculosis following traumatism, the lesions remain localized in the genital apparatus and its lymph glands.

Marie Gorovitz reaches similar conclusions from her experiments on 11 rabbits and 15 guinea-pigs, using pure cultures of tubercle bacilli diluted with sterile boiled water. She concludes: (1) Simple deposit of the bacilli in the vagina without trauma will not give rise to tuberculosis. (2) Deposit of bacilli in the uterine cornua of the guinea-pig produces tuberculosis which may be propagated to the vagina or first reach the iliac or lumbar glands, especially at the bifurcation of the lumbar aorta, which are nearly always caseous. (3) In some cases the bacilli seem to pass through the uterine cornua without causing any macroscopic lesion and directly invade the lumbar glands. (4) Tubercular peritonitis may be observed secondary to tuberculosis of the uterine cornua, and seems consecutive to subperitoneal lesions of this organ. (5) In rabbits, inocula-

tions made with the same technic as in guinea-pigs were unsuccessful.

Gaertner considers infection by coitus rare, for he claims that if it were frequent the glans penis and urethra would often be found tubercular, while in actual practice this is exceptionally the case.

Another argument against this as the only mode of infection, according to some authors, is furnished by cases occurring with colpatresia.

For example, H. Thompson reports the case of a girl of 15 with atresia. The vagina was distended by a turbid liquid, there were miliary granulations on the cervix and caseous nodules on the pelvic peritoneum, besides tuberculous bronchial glands.

Gersung extirpated the uterus, adnexa and part of the vagina in a woman of 19 with congenital colpatresia. The vagina and distended uterus contained over three liters of grayish-yellow liquid. The mucosa of the tubes, uterus, and especially the vagina, was caseous and contained giant cells. The tubes, though short and presenting nodular thickenings, were permeable at the orifices.

Most authors deny the congenital infection of Baumgarten except in very young children.

Fers reports a case which seems to prove the transmission of tuberculosis to the fetus. Schmorl and Kokel have more than once discovered tubercle bacilli in the placenta, and in a child 30 hours old whose mother died of tuberculosis Bugge found bacilli both in the umbilical and hepatic vessels.

Any disease which causes abnormal secretions, as gonorrhea, for example, lessens or destroys, or better, they produce the necessary abrasion for inoculating the bactericidal action of the vaginal mucus. The frequency of postpartum tuberculosis shows that the puerperal state, with its attendant traumatism, is a common source of primary infection. Thus, in 16 cases of miliary tuberculosis which appeared during the puerperium, cited by Merletti, in five caseous foci were found

at the ends of the tubes. In Orthmann's 23 necropsies on genital tuberculosis, eight were of the miliary variety (Dührssen's) and several of these had commenced during the puerperium.

Even operative intervention may give rise to the disease, as in Dührssen's case (cited by Amann), where catheterism of the uterus to overcome sterility led to acute tuberculosis of the tube and peritoneum. Attention may also be directed to Carbonelli's case, where general tuberculosis ensued fifty days after an operation for tubercular ovarian cyst.

Extension from the intestine is looked on by Naegeli as exceptionally rare, since the mesenteric glands are so rarely involved. Amann, Hegar and Von Rosthorn have also noted the absence, or but slight involvment, of the retroperitoneal glands. Amann, however, calls attention to three cases met with by Dührssen. In three patients adhesions between tubercular loops of bowel and the fallopian tubes led to secondary tuberculosis of the latter. As all three patients drank much raw milk, Dührssen investigated the source of the milk and found the cow tuberculous. In this connection, Strassman's cases of genital tuberculosis in a butcher's wife and in a girl looking after the cows on a farm, are of interest.

(We have observed in two cases the adherent fimbriated end of the tubercular tube communicating with the intestinal tract, with tubercular ulcer of the intestine at the point of union. This we interpreted as a primary tuberculosis of the tube with secondary ulceration of the wall of the intestine and tubercular infection at that point. Again, in not a small number of cases circumscribed tubercular abscesses communicate with the tube and with the intestine. In all of these cases, also, we have attributed the primary lesion to the tube, as in all of them the other tube was involved and in two the fimbriated end of the other tube was open and no mixed infection, though the tube was tuberculous.)

While genital tuberculosis is common after the meno-

pause, Kaufmann directs attention to senile involution of the cervical tissue in old women as favoring the production of the condition. In a necropsy on a woman of 77 years, presenting no traces of tuberculosis elsewhere, an ulcerated cervical lesion was found which had the gross appearances of carcinoma, but proved, on microscopic examination, to be tuberculosis.

The order of frequency with which the organs are involved is: Tubes, uterus, ovaries, vagina and vulva. A single segment may be involved (although this is rare): on the other hand, cases are reported where the whole genitalia were attacked, e. g., those of Geil, Gusserow, Kretz, Frerichs, Davidsohn and five by Voigt.

IV. DIAGNOSIS.

Martin emphasizes the fact that up to the present time we know of no pathognomonic clinical symptom of genital tuberculosis, and especially of its chronic form.

Hence the anatomic diagnosis can be established with certainty only by the discovery of the specific bacillus of tuberculosis. The search for this must be undertaken in every case where there is reason to suspect its presence. As in other forms of local tuberculosis, and especially in chronic cases, the bacilli may be very few in number (only one in forty-seven slides). However, a systematic examination of scrapings and discharges for the bacillus will reveal its presence in a surprisingly large number of cases, as mentioned above. The search for the bacilli being so difficult, some authorities are content with the discovery of typical tubercles. The great similarity of the smegma bacillus to that of tuberculosis must not be lost sight of.

For finding the tubercle bacillus Alterthum prefers the Kuhne-Bordel method. This consists of coloration of the nucleus with hematoxylin and hematin, washing in water, then coloration in Ziehl's phenic-fuchsin for fifteen or twenty minutes. Differentiate by passing through a 2 per cent. solution of hydrochlorate of anilin

for a few seconds, decolorize cautiously with alcohol, lastly xylol, etc.

Babes, in 1883, was the first to discover the bacilli in vaginal secretions, and they may be sought for either by the microscope or by the culture method. Veit recommends inoculation in animals in addition, especially guinea-pigs, which he considers preferable to simple examination. This inoculation may be made from vaginal secretions or from aspirated peritoneal fluid. This inoculation is one of the most reliable tests for tuberculosis and is neither difficult nor slow in giving results and should be resorted to in every case.

Bimanual examination is not very conclusive, though Hegar and his school insist on the diagnostic value of the nodes found on or in the uterosacral ligament. (For the conflicting views as to the nature of the nodes on the free ends of the tubes, "salpingitis isthmia nodosa," see section on tubal tuberculosis.) According to Veit adhesions due to tuberculosis are, as a rule, rather easily distinguished from those of gonorrheal origin, being much more extensive.

In doubtful cases the general systemic examination becomes of great importance, especially a detailed study of the clinical history. In Senn's experience, the use of the thermometer has been of great diagnostic value in tubal tuberculosis. He states that "a constant slight rise in the evening temperature, and a normal or slightly subnormal morning temperature, are very suggestive of the tubercular nature of the tubal affection."

Veit, who regards genital tuberculosis as generally secondary, believes the principal object of the clinical diagnosis is to determine whether the infection is limited to the genitalia or affects other organs also.

Martin directs attention to the frequent coincidence found of late between tubal pregnancy and tubal tuberculosis, which he considers of great interest from a diagnostic standpoint. He believes we are justified in supposing the former to be a consequence of the tuber-

culosis, and when confronted with tubal pregnancy we must bear tuberculosis in mind.

V. SYMPTOMS.

These are neither numerous nor characteristic. In Martin's cases sterility was the most prominent symptom. Only one of his twenty-four patients with genital tuberculosis became pregnant during the course of the disease, and twelve others had few or no children. The contrast, he states, is the more striking since many had gone through a series of pregnancies.

Mentrual disturbances are slight, especially at the onset. Later on, after the inner surface of the uterus has become caseous, there may be amenorrhea. In other cases there may be menorrhagia.

Menorrhagia in young girls should always arouse the suspicion of tuberculosis, and careful and repeated microscopic and inoculation tests should be made, both during the period and in the interim. The presence of menorrhagia has been valuable in many cases in leading to the diagnosis of tuberculosis of the genital tract.

Vassmer, in six cases of uterine tuberculosis, observed no discharge. In some cases, however, there is an abundant mucopurulent discharge, with passage of caseous masses. Even then there is nothing characteristic about the discharge, unless bacilli are present.

Pain is not complained of by most patients, except occasionally in tubercular salpingitis.

VI. PROGNOSIS.

While the prognosis in tuberculosis of the genitalia and peritoneum is always very serious, the disease is not at all as fatal when properly treated surgically as we have been led to believe. In the first place, spontaneous cure is possible, though undoubtedly uncommon; again, a localized focus is favorable for extirpation, as proved first by Hegar and by numerous operators since. The prognosis will depend on whether there are tubercular lesions elsewhere and their extent. If the disease

in the genitalia is secondary to lesions elsewhere, the genital complication does not seem to add to the gravity of the original disease. In cases occurring in the puerperal state, death may ensue with extraordinary rapidity. Other things being equal, the results of surgical treatment are very satisfactory.

So much for the general consideration. We will now analyze the individual types of the disease as it manifests itself in different portions of the genitalia and peritoneum.

A.—TUBERCULOSIS OF THE VULVA.

FREQUENCY.

This is the most infrequent variety of genital tuberculosis; in fact, it is so rare that Spaeth was unable to find a single case of primary tuberculosis recorded up to 1885. This infrequency of the disease in a region easily accessible to external infection is looked on by some writers as an argument in favor of the descending, or secondary, route. It is, however, more probable that the bacilli pass over the external genitals and find a more appropriate soil in the internal organs—uterus, ovary, and especially the tubes. While rare, there are several well-authenticated cases of vulvar tuberculosis.

CASES.

Cayla reported a case of extensive ulcers of the labia and vaginal orifice. The numerous nodules, on microscopic examination, showed the characteristic structure of tubercles. The lungs were involved also.

Deschamp's patient also had advanced pulmonary lesions. She was 25 years of age and some months before had sustained an injury to the vulva by a fall; shortly after leucorrhea and intolerable pruritus appeared. There was deep ulceration of the left labium minus and the fourchette. Pieces of tissue showed the typical appearances of tubercle, and on being inoculated in guinea-pigs, the results were positive. Death occurred in seven months from the time of the injury and tuberculosis of the lungs and external genitalia were found at the necropsy.

Chiari reported a case in a woman of 30. There was pulmonary tuberculosis as well as extensive tubercular ulcers in the rectum. Necropsy showed the internal genital organs were not involved. A large ulcer of the vulva was present, which had involved the vagina also.

Deuse reports three cases of primary tuberculosis in children: 1. Child 13 months old; ulcer situated on inner aspect of left labium minus. The secretions from this contained numerous tubercle bacilli. Death at 16 months from tubercular meningitis. In addition to the ulcer of the vulva, a more recent one was found in the vagina also containing bacilli. 2. Child of 7 months with tuberculous father; ulcer situated at orifice of vagina. 3. Child of 15 months with good family history. A mucopurulent discharge appeared after an attack of measles; ulcer at orifice of vagina; tissue proved tuberculous by microscopic examination. Died from tuberculous pneumonia: tubercle bacilli were found in one of the iliac glands.

In Zweigbaum's case the vulva was attacked by an ulcer of the vagina extending to the former. Death occurred from pulmonary tuberculosis and the uterus and appendages were not involved.

Viattel reports the case of a woman of 36 who had had a yellowish discharge from the vagina for seven years. For three years she had noticed little growths on the vulva, which frequently fell off and reappeared. These growths were found to cover an ulcer bordering the vagina, with a firm base and covered with a yellow crust in places. The growths contained no bacilli, but many were found in scrapings from the ulcer.

Montgomery's case was a negress of 30. Family history and childhood negative; four children, one miscarriage. Burning on urination, extending back for years. Labia enlarged, ulcer on inner aspect with indurated borders; induration extended over anterior wall of vagina and about the urethra. Microscopic examination of a fragment excised showed characteristic tubercle formation.

Schenk reported a case in a little girl of 4½ years. There was an ulcer of the vaginal orifice, which had involved the left labium minus, the clitoris and the urethra; the inguinal glands were enlarged. The child had

two tuberculous playmates and Schenk thinks infection probably occurred through the fingers.

Davidsohn's case concerned a woman who had an excessively hard labor. Two days later, acute miliary tuberculosis appeared and proved fatal in three weeks. At the necropsy the entire vagina, as well as the labia minora, were strewn with recently-formed miliary tubercles. The cervix and urinary passages were not involved. The diagnosis was confirmed by both histologic and bacteriologic proof.

In Karajan's case, a little girl of two years, with good family history and no signs of visceral tuberculosis, developed pruritus of the vulva with a coincident ulcerative keratitis. Shortly after, a progressive vulvar ulceration occurred; the skin was red, excoriated and covered with crusts. On separating the labia a tumor was seen, corresponding to the clitoris, firm, the surface covered with small ulcers the size of a pinhead, and with a thick, eczematous crust over all. Elephantiasis of the clitoris was diagnosed and the tumor extirpated. Ten months later, a new vulvar ulcer appeared, with enlarged inguinal glands. Another tumor had appeared in the scar of the operation; this was again extirpated. The excised tumors were composed of connective tissue covered by normal skin, with tubercles irregularly distributed below the derma. Bacilli were found, though few in number. Scleroderma with small ulcerations here and there of the external genitalia should arouse the suspicion of tuberculosis and a most careful search should be made for its characteristic pathologic changes.

Reick reports a case in a woman with good family history, but whose husband died of pulmonary tuberculosis. There was an ulcer of the vulva with hypertrophy of the labium minus. Excision; tissue showed tuberculous lesions.

In Kelly's case, a patient of 55 complained chiefly of the stinging pain caused by the urine flowing over the

ulcerated vulva. The disease involved the vestibule and the central portion was eaten out; the deeper tissues, while infiltrated, were not especially indurated. A few bacilli were demonstrable. On histologic examination the surface was found to be made up of the characteristic granulations, with scattered tubercles through the deeper tissues, some located immediately below the urethral mucosa.

Kuttner reports the case of a little girl of 6 with bronchial catarrh. The sputum contained tubercle bacilli. There was induration of the right labium majus, with an ulcer in the upper two thirds; there were also some small ulcers over the mons veneris and the upper part of the left labium majus. Excision, suture, cure. Examination of the excised tissue and the tributary lymph glands showed the characteristic tubercular lesions.

So it will be seen there are numerous cases of tuberculosis of the vulva on record and they would be materially increased if cases described as esthiomene, lupus, rodent ulcer, etc., were included, as they should be. Esthiomene was first described by Huguier of Paris, who reported nine cases in 1848. The French school looked on it as a scrofulous manifestation. The English surgeons of the same period regarded it as a *noli me tangere* belonging to the epitheliomata. For instance, Paget, after examining some tissue said: "When a specimen for examination microscopically was taken from the substance of the base immediately beneath its surface, I found nothing but the natural tissues of the mucous membrane (rete malpighii) with infiltration or inflammation with reparative material. If taken from the surface, on examination of the ulcer during life, they would have led to epithelial cancer."

PATHOLOGIC CHANGES.

Since the structure of the vaginal mucosa is practically the same as that of the surrounding skin, the patho-

logic changes resemble those in tuberculosis of the skin itself. We have a diffuse chronic inflammation with perivascular infiltration of small round cells. Epithelioid and giant cells are found on section. The specific bacilli are also found, but few in number, and can sometimes be discovered only after examining a number of sections. In the older parts of the lesion the bacilli may be entirely wanting. In the appearance of the ulcer it often resembles a carcinoma or epithelioma of the labium. In the former there are frequently small healed areas, while the latter never has healed areas.

CLINICAL COURSE.

The onset is in the form of a dull red or livid discoloration of the skin, which is indurated and slowly increases in size. After a variable length of time, these tumor-like masses soften and break down, forming ulcers. These ulcers vary considerably in size, are round, oval or irregular in shape. The edges are infiltrated at first, later on ragged and undermined. The base is uneven, granular and covered with a yellow crust. Miliary tubercles are often seen about the borders. The ulcers do not bleed readily and show no tendency to heal, but advance slowly or heal behind as they advance. After a time, from coalescence, an extensive destruction of tissue may take place, with fistula formation and destruction of the perineal body. In other cases, there is great proliferation of tissue, with formation of nodules and polypi. If the disease involves the clitoris, this may be so enlarged as to be mistaken for elephantiasis. The inguinal lymph glands are not involved for a long period.

Pain is not noticeable, and the first symptom noticed, as in Kelly's case, may be pain on urination after a well-defined ulcer is present. In many cases the disease is of such slow growth that it remains unnoticed for years.

DIAGNOSIS.

The only diseases likely to prove difficult of differentiation are syphilis, phagedena and carcinoma. In some

cases the distinction is very embarrassing, even after a careful anamnesis. As before stated, the inguinal glands are not often involved in tuberculosis; this and the multiplicity of the ulcers and the negative results of specific treatment will distinguish it from syphilis. From carcinoma, it can, as a rule, be told by the exceedingly slow progress of the disease. In many cases resort must be had to microscopic examination of pieces of excised tissue, search for the bacilli and animal inoculation with the secretions.

TREATMENT.

The only treatment of any avail is radical extirpation. Escharotics, such as iodin, the thermocautery, cauterization with chromic acid crystals or zinc chlorid solution 40 to 50 per cent. may be used in mild cases, but the disease almost inevitably returns. The tuberculous tissue must be completely excised and the parts sutured. In case of extensive loss of tissue, plastic operation may be called for after the excision. The *x*-ray should avail here as in superficial carcinomata, but experiences to date are very limited and results problematic.

B.—TUBERCULOSIS OF THE VAGINA.

FREQUENCY.

As regards frequency, this form is usually found in association with similar lesions in the upper portion of the genital tract; it has, however, been discovered in several instances to be the only site of tuberculosis in the genitalia. There seems to be but one case of primary tuberculosis of the vagina known, that of Bierfreund, in which a tubercular ulcer of the vagina was the sole focus in the entire body.

ORIGIN.

According to Amann, it may arise in the following ways: (*a*) The infection comes directly from the uterus, vulva, rectum, bladder or by recto- or vesico-vaginal fistulæ, or through Douglas' pouch from the peritoneum. (Babes in 1883 reported a tubercular ulcer in the rectum which perforated the rectovaginal septum, giving rise to secondary tuberculosis in the vagina.)

(*b*) From contact of uterine and tubal discharge containing tubercle bacilli, or from an infection by the feces (and urine—Virchow), after fistula formation.

(*c*) Directly through the blood current.

(*d*) Direct infection from without.

CASES.

H. Thompson, many years ago, reported the case of a girl of 15, who, after being in apparent good health, died suddenly after an illness of about seven days. Miliary tubercular lesions were found in the lungs, diaphragm, liver, spleen, kidneys, and meninges. The hymen was imperforate and the vagina was dilated into a pouch eight inches in circumference, containing 25 or 30 fluid ounces of "dark, grumous, offensive material." The fundus and cervix uteri were covered with tubercular

granulations. The vaginal mucosa was very vascular and also infiltrated with tuberculous granulations.

Breisky mentions the case of an aged woman who had tuberculosis of the vagina and was operated on for an ovarian cyst. Microscopic examination of the latter showed tuberculosis of the cyst walls.

In Zweigbaum's case there was tuberculosis of the vagina in addition to the vulva and portio vaginalis. On the posterior wall of the vagina was an ulcer with hard, raised borders. This was covered with thick, grayish-yellow mucus; a similar ulcer was found on the cervix. The uterus was enlarged and tender, the inguinal lymph glands swollen and hard but not painful. The lesions, later on, involved the left labium minus and destroyed it entirely. The tubercular nature of the process was confirmed by microscopic examination.

An interesting case was met with by Weigert in the cadaver of a woman of 67. In addition to a tubercular ulcer of the ileum and peritoneum, the vagina presented tubercular lesions in all stages, from miliary granulations to caseous degeneration of ulcerations; yet the uterine mucosa was completely intact.

Sippel reports the case of a virgin of 20, in good health but with hereditary history; extirpation of a caseous tube and tuberculous ovary; tubercles were found on the adjacent peritoneum. Later on, tuberculosis appeared on the other side on the uterine mucosa; partial extirpation of the adnexa on this side and treatment of the endometritis resulted in a cure of two and a half years' standing when reported. This author believes there was infection of the vagina, then of the uterus and next of the tubes. He sees in menstruation, during which the superficial epithelium is eliminated and the resistance of the vagina increased, a protection against uterine invasion.

Forfida narrates the case of a woman with no family history, and whose husband was healthy, who, soon after delivery, presented a tubercular ulcer of the vagina with

consequent glandular infection and no signs of the disease elsewhere. In this case the probable source of infection was a woman dying of the pulmonary form whom the patient visited. Bacilli were found in the vaginal secretions and in the ulcer, and probably gained entrance through the lacerations incident to delivery. A cure resulted after curetting and the use of the cautery.

Springer, who reports a series of twelve cases of secondary vaginal tuberculosis, found but two evidently due to blood infection; in the rest it was due either to extension by contiguity or to contamination by secretions or tubercular masses proceeding from the uterus and tubes.

PATHOGENY.

The miliary variety seems to be less frequent than the ulcerative, though miliary tubercles are nearly always found in the vicinity of the ulcers. The latter are either shallow or deep, with a flat floor, covered with a grayish crust. Here, as elsewhere, the ulcers frequently become confluent, with consequent increase in the loss of tissue. As before stated, in Babe's case a tubercular rectal ulcer penetrated into the vagina. On the other hand, the process may extend in the opposite direction from the vagina into the bladder or rectum and give rise to fistulæ and secondary foci in these organs.

SYMPTOMS AND DIAGNOSIS.

The symptoms present nothing pathognomonic and the diagnosis, owing to the accessibility of the lesions, is attended with less difficulty than when deep seated. Here again it is to be differentiated from syphilis and malignant disease, and here, also, we must rely on the aid afforded by specific treatment and by microscopic examination of excised tissue and staining and inoculation of secretion. In this variety the discharge seems to appear early and it is frequently yellowish. The ulcers are both insensitive and bleed with difficulty.

TREATMENT.

In the milder cases the application of chemical agents, as chromic acid or curettement, may suffice. In the severe ones, more vigorous measures are necessary, even partial or complete removal of the uterus, with vaginal wall, when the ulcers are numerous about the posterior fornix, as they sometimes are.

C.—TUBERCULOSIS OF THE PORTIO VAGINALIS AND CERVICAL CANAL.

FREQUENCY.

This form is very rare and seldom combined with tuberculosis of the fundus. Thus Spaeth, in 119 cases of uterine tuberculosis, found the cervix affected in only 6. Wassmer, in 6 cases of tubercular endometritis, reports the cervix free from changes. Stolper reports nine cases of genital tuberculosis in one of which the cervix was involved. In 27 necropsies on tuberculous women by Doran, there was involvement of the genitalia in 5, but of the cervix in one only. Geil records two cases in which the fundus, tubes and vagina were tuberculous, yet the cervix remained free. Michaelis, in reporting 3 cases of cervical tuberculosis, states that he regarded one as a primary tuberculosis since the uterus itself exhibited no changes. The other two were associated with tuberculosis of the upper genitals and lungs. This case, it seems, is not the only one of primary cervical tuberculosis. Others have been reported by Friedländer, Emanuel, Kauffman and Spaeth.

CASES.

Cornil studied a uterus removed by hysterectomy for supposed cancer. The cervix was hypertrophied and transformed into an indurated mass with irregular vegetations. In spite of the advanced state of the lesions, nothing could be told from the histologic examination and the inoculations alone were conclusive.

In Emanuel's case a woman of 50 had a tumor of the cervix the size of an apple, with invasion of the vagina. Microscopic examination showed tuberculosis; hysterectomy; death. Necropsy showed the lungs healthy; there was miliary tuberculosis of the liver, spleen and peritoneum. The cavity of the uterus was entirely filled

with caseous masses. Since the tubes were absolutely unaffected, Emanuel believes this proves the disease to be primary in the cervix. What confirms it, in his opinion, is the considerable increase in size of the cervix and the invasion of the vagina. In cases of secondary invasion of the cervix there is no such increase in size.

Williams narrates two cases of ulcer of the portio vaginalis, which on necropsy examination showed tubercular nodules and bacilli. The lesion was clearly limited to the vaginal portion of the cervix and the neighboring part of the vaginal mucosa; the rest of the genitalia were absolutely normal. In both patients there was extreme pulmonary disease.

Walther reports the case of a woman of 26; no family history. After a normal accouchement, he noticed a profuse bloody-mucous discharge, with erosion about the cervix, bleeding easily. Curettement; cure. The interesting point in this case is the histologic examination of fragments of mucosa. In that from the cervix, it was possible to find islets of pavement epithelium, a typical ulceration deprived of epithelium and strewn with miliary tubercles and in places granular cells with caseous masses. One might, says the author, suppose the tubercular process to be limited to the cervix, but examination of the mucosa from the fundus showed, besides marked glandular hyperplasia, giant and epithelioid cells in the interstitial tissue, but without any characteristic tubercles.

Matthews records the case of a negress of 32 with dysmenorrhea for three years; mucopurulent discharge and hypogastric pain. The cervix was twice the normal size, ulcerated and bled easily, with propagation of the ulcer to the vagina. Hysterectomy per vaginam, with partial ablation of the vagina. Examination after removal showed diffuse infiltration of the cervical cavity (tubercles, caseous degeneration), miliary tubercles of the muscularis. Mucosa of the fundus and the tubes negative.

Driessen's case concerned a woman who had been operated on seven years before for stricture of the rectum and had been complaining for some time of menorrhagia and a mucopurulent discharge. The cervix was found hypertrophied and studded with many small ulcers, most numerous about the os, and growing fewer toward the periphery. In the cul-de-sac were little red spots with small yellowish centers. Vaginal hysterectomy. Examination of organ after removal showed characteristic change of tuberculosis. Here and there the epithelium of the cervical glands projected into the interior of the glands, forming papillary excrescences. In certain locations, little cavities filled with polynuclear leucocytes were found between the epithelial cells. These may be considered as small abscesses or as a commencing necrobiosis and are very characteristic of a tubercular affection.

Vitrac gives details of a woman with tubercular history, the cervix was enlarged posteriorly with hard irregular masses; the uterus itself was small. Consolidation of left apex. Hysterectomy; examination showed the masses collected in the cervical lip. Follicles more or less mixed up between the base of the glands inside, and the cervicovaginal mucosa outside. Some were separated from one another by the organs about which they are developed—acini, vessels, etc. Bacilli were found and inoculation experiments in guinea-pigs were positive.

In Frank's patient, the disease was mistaken for sarcoma. Some five or six years previous she had tuberculosis of the metacarpal bone and one phalanx of the middle finger, which were excised, and a cure resulted. The portio vaginalis was much modified and resembled a grayish-yellow mushroom. The tissue about the os was proliferated and covered with vesicles and nodes. This proliferating mass bled easily, and everything seemed to indicate a cancerous growth. A piece being excised for examination, violent hemorrhage ensued, so

free as to require gauze tampons. The uterus was extirpated, the tubes being apparently healthy; recovery; the secretions examined three months later showed us bacilli. Frank believes the infection in this case was communicated by the hand or by soiled linen. He thinks the idea of infection by metastasis or through the lymphatics must be abandoned, for the peritoneum was normal and contained no fluid. A curious feature was that the patient had never suffered any pain, and sought relief for amenorrhea.

Beyea's case was a young woman of 23 with no tubercular history, but having irregular menstruation and leucorrhea for three years. The portio vaginalis was hypertrophied to twice its normal size, and was eroded for some little distance (nearly an inch in places) from the os: this eroded area was bright red and bled easily. Pieces exhibited showed miliary tuberculosis and giant cells. Curettement, high amputation of cervix and bilateral salpingo-oöphorectomy: patient in good condition sixteen months later. Microscopic examination: The flat epithelia of the portio vaginalis showed inflammatory changes beginning by proliferation half inch from the os externum and progressing in some places to complete destruction: at first the cells preserved their outline, then coalesced into a homogeneous mass, which gradually disappeared. An extensive infiltration of small round cells in company with leucocytes was quite general under the squamous epithelial layer, and in places even penetrated the latter. The papillomata growing from the cervical canal were slender, close together, covered with columnar and cubical epithelium. The stroma also was infiltrated with small round cells, leucocytes and an occasional miliary tubercle, frequently inclosing giant cells. The underlying endometrium and a considerable portion of the new tissue showed the same changes. Bacilli were discovered only after examining several slides.

Lewers met with what he considered primary tubercu-

losis of the cervix, which simulated cancer and was treated by hysterectomy, with recovery. The patient was a multipara of 36, and for nine months had a fetid and sometimes bloody discharge, in which shreds of membrane could be distinguished; there was vague pain in the lower abdomen. An aunt had died of tuberculosis, but this was the only case of the disease in the family. On inspection the os was found enlarged and occupied by a soft, friable tumor, which bled easily on being touched. The uterus itself was not enlarged and was very mobile. On examining the specimen, the cervical canal was found occupied by a papillary tumor extending to the os internum. Under the microscope the mucosa was the seat of inflammatory thickening in the form of bands; these, on section, showed groups of grayish tubercles, with masses of well-formed giant cells. Six sections were examined for bacilli, with negative results. Lewers expresses the belief that cases of this kind may explain the occasional instances of apparently spontaneous cure of cancer.

PATHOGENY.

It is evident that several varieties of this form of tuberculosis are met with—the ulcerative, which is the most common—the papillary, or budding, which Emanuel considers to be characteristic of cervical tuberculosis; miliary tuberculosis; and lastly, the "bacillary catarrh" of Schütte.

As Martin observes, it is remarkable that even in the puerperal uterus, in which the cervix has undergone considerable trauma, this portion, as a rule, presents no tubercular lesions, while those of the tubes are far advanced. Is it the tenacious secretion of the cervical mucosa or, as Vassmer believes, the thick epithelial layer here which opposes the penetration of the bacilli? This point, says Martin, remains unsolved as yet. Menge experimentally infected the cervical canal with many different varieties of bacteria and found it sterile twelve hours later.

Merletti (quoted by Amann) made some interesting experiments with uterine secretions obtained through the canula. He was able to obtain results in cases even when no tubercle bacilli could be detected in the discharges. Inoculations made with the fluids thus obtained showed the existence of tuberculosis, not only where the disease involved the uterus, but where the peritoneum was affected. Hence, positive results from inoculations do not always indicate genital tuberculosis, they maybe due to peritoneal disease, but the inoculation should be made in every suspicious case, as it involves no risk to the patient and when positive shows the disease in some portion of the tract.

Fraenkel was the first to point out that tuberculosis of the cervix may exist in the same subject with similar disease of the tubes and the intervening fundus be entirely free. Sinclair has also pointed out a somewhat similar predilection. In tuberculosis of the fundus, the disease seldom extends to the os internum, while conversely carcinoma of the cervix as seldom extends up through the os.

Beyea, in addition to this own case, collected 68 others of tubercular infection below the internal os from the literature. Thirty of these were discovered at the necropsy, with far-advanced lesions of the genital tract and distant parts. Two were postmortem discoveries of primary cervical tuberculosis. Twenty-two were clinical cases—of these 3 were associated with lesions in other parts of the genital tract and distant parts of the body 4 with lesions in distant parts alone, 9 were restricted to the cervix; in 19 cases of the total 69 the disease was localized in the portio vaginalis; in 6 to the cervical canal; in the remaining 44 both portions were involved. These statistics impress on us how frequently the disease is overlooked and how frequently the disease is limited to the cervix uteri.

Ulcerative Form.—This may be met with as large or small ulcers occurring over the vaginal portion or cer-

vical canal. When large they are usually single, and when small, multiple. In some cases the entire portio vaginalis is eroded and excavated. The ulcerative process appears to commence near the os externum and spread over the vaginal portion and up the canal. When the ulcers are large they are scooped, but with abrupt edges. The cervix is quite generally hypertrophied. The bed of the ulcer is lower than the margin, differing from cervical erosions or ectropium of the cervical mucosa.

Papillary Form.—In this variety there is great hyperplasia, forming a fungous mass or masses of a pink color, and occasionally reaching a great size, as in Emanuel's case, where it was as large as an apple. In the advanced stages these masses may be partly cast off, leaving a surface covered with tubercles. Fraenkel compares these proliferations to the similar ones frequently found on the nasal mucous membrane. The mass bleeds readily and bears a close resemblance to carcinoma, and to increase the confusion, Alterthum, in one case, discovered in addition to proliferations of the surface and gland epithelia, concentric imbricated deposits of cells, resembling the "epithelial pearls" of cancer. Tubercular changes were recognized with great difficulty, and the microscopic picture much resembled that of carcinoma. The cervix is always hypertrophied, irregular and elastic.

Miliary Form.—Tubercles may be found scattered over the portio vaginalis, cervical mucosa and in the stroma of the cervix. Associated with this form there usually occurs diffuse formation of granulations, with a tendency to fibrosis in some cases. These granulations may become conglomerated, softened and an ulcer results.

Bacillary Catarrh.—In this variety, pointed out by Schütte, the process is limited to the surface epithelium and the glands, which may be filled with caseous material containing numerous bacilli.

As regards microscopic appearances, we find many

variations in cervical tuberculosis, depending on the stage of the process and the form of the disease. Tuberculosis of the cervical mucosa manifests itself primarily by a proliferation and metaplasia of the surface and glandular epithelium. The gland lumen becomes occluded by division of the lining cells. In cases like the one of Alterthum, already alluded to, where the microscopic appearances closely resemble carcinoma, a large number of slides must be examined until the tubercular nature is positively demonstrated. In the beginning of mild forms of cervical tuberculosis, the infiltration of small cells may be limited. After the glandular lumen is obliterated by proliferation of the lining cells, the glands appear as solid columns. As the disease progresses the metaplastic cells show retrogressive changes, finally ending in necrosis and caseation. Giant cells are only occasionally encountered in the gland proper. According to Emanuel, the cervical glands and stroma may also hypertrophy in the tubercular process and resemble the section of an adenoma.

As the degeneration of the epithelium progresses, granulations take its place, and the cervical mucosa is now covered with granulation tissue in which only glandular débris may be recognized. Giant cells and tubercles are now observed. More or less hypertrophy of the connective tissue is seen in nearly all forms, coexisting in the more chronic forms with areas of caseation and necrosis. In the papillary form, the fungous growths are made up of granulations and new formed connective tissue, in which are blood vessels, giant cells and tubercles in addition to diffuse epithelioid cell formation.

SYMPTOMS AND DIAGNOSIS.

In this, as in the other forms of genital tuberculosis, the disease is most active during sexual life. The ages in 58 cases, as given by Beyea, are as follows:

17 to 20 years, 6 cases.
21 to 30 years, 27 cases.
31 to 40 years, 9 cases.
41 to 50 years, 5 cases.
51 to 60 years, 5 cases.
61 to 70 years, 3 cases.
71 to 79 years, 3 cases.

The subjective symptoms are vague. The patients usually complain of a profuse leucorrhea, purulent in character, and occasionally tinged with blood and a peculiarly offensive odor, but not like that of malignant disease; this was present in 24 of 37 clinical cases. As regards menstruation, it was normal in 3, absent in 12, and profuse in 13 cases.

DIFFERENTIAL DIAGNOSIS. (Whitacre.)

Uterus.	Tuberculosis.	Epithelioma.
Size.	Small	No regularity.
Aspect. . . .	*Papillary form.*—Muriform mass with small vegetations in the vicinity. *Ulcerative.*—Surface covered by caseous material and mucus; border seed bed of granulations.	Usually fungous. The cavity form lacks granulations in the edges. Never solely interstitial.
Touch. . . .	*Papillary.*—Surface knobb'd, smooth, polished, elastic, no induration, limits not clear. *Ulcerative.*—Depressi'n without diffuse infiltration. border granular.	Surface roughened; consistence very hard. If large and fungous, the base is very hard.
Color	*Papillary.*—Rose-red, deeper color than surrounding. *Ulcerative.*—Bottom yellow or red.	Grayish.
Spontaneous pain.	Little or none.	Characteristic.
Sensitiveness.	Present.	Absent.
Bleeding. . . .	May be slight in both papillary and ulcerative form.	Frequent and abundant.
Discharge. . .	*Papillary.*—Mucous. . . . . *Ulcerative.*—Often purulent.	Fetid and abundant.
Progress . .	*Papillary.*—Extremely slow. *Ulcerative.*—Slow, yet may produce extensive ulceration and fistulæ.	Progressive and accompanied by constitutional symptoms.
Pathologic histology.	Both show typical miliary tubercles and tubercle tissue.	Typical epithelioma with pearls and columns of pearls.
Bacteria. . .	Tubercle bacilli found in smear preparations or by inoculating guinea-pig.	None.

Clinically, the differential diagnosis between erosions, inflammatory proliferations and commencing carcinoma is sometimes exceedingly difficult. In suspected tuberculosis, we should look especially for small nodules, areas of caseation and ulceration; not finding these, a portion should be excised for microscopic examination. Beyea observes that, as in early carcinoma of the cervix, the diagnosis of tuberculosis must be always

that of suspicion, to be made positive by microscopic examination of the fragments removed by cutting, and not by the curette; also by inoculation of fragments into guinea-pigs.

The unsatisfactory nature of the symptoms may best be judged from the clinical diagnosis of 56 cases given by Beyea. In 14, it was carcinoma or suspected carcinoma; in one, sarcoma; in 4, ulcer of the cervix; in one, ulcus rodens; in one, vegetative growth of cervix; in one, indefinite cervical disease; in 28, phthisis or tubercular peritonitis; in one, tubercular meningitis; in one, apoplexy; in 2, abdominal tumor; and in one, caries of spine.

TREATMENT.

Frank and Emanuel believe it best to remove the uterus. Michaelis distinguishes between primary and secondary genital tuberculosis. He advocates curettement, if the uterus alone is involved, without the adnexa. In the secondary forms, a radical extirpation, providing the patient's condition will permit.

From Beyea's statistics we learn that 15 cases have been treated by surgical measures; ten panhysterectomies; one curettement, combined with amputation of the cervix and double salpingo-oöphorectomy; and 4 by amputation of the cervix.

Of the hysterectomies, 3 died from shock, phthisis and tubercular peritonitis. Of the remaining 7, the majority (six) were well after 5½ years; in one, only four months had elapsed.

The case of curettement, amputation, etc., was apparently cured sixteen months after the operation. Two of the amputations of the cervix recovered and 2 died of phthisis.

Local applications were made in 11 cases; one is said to have recovered, 5 improved temporarily, and in 5 the disease progressed. In the cases where the cervix alone is involved, amputation of the cervix is ample. An

operation, as panhysterectomy, which gives a mortality of 30 per cent., should not be performed, except in the rarest instances. Curettement, with cauterization by 30 per cent. chlorid of zinc solution, applied by a saturated gauze tampon, which should be allowed to remain 36 hours, gives good results, and if the disease shows return, it is in a small area and favorable for extirpation. It has the same effect as a preparatory cauterization for extirpation of the uterus in carcinoma of the cervix.

D.—TUBERCULOSIS OF THE FUNDUS UTERI.

FREQUENCY.

This form is the most frequent after tuberculosis of the tubes.

Merletti, in 172 cases of genital tuberculosis, found well-marked lesions of the uterus in 75.

Stolper, in 34 necropsies on tuberculous women, found uterine tuberculosis in 3, and Wolff, in 17 similar necropsies, found uterine tuberculosis in 3 also.

Vassmer, reporting 6 cases of tuberculosis involving the uterus, in 5 of which diagnosis was established by the curette, states they appeared at the clinic within ten months.

Cullen, in eighteen months, diagnosed 6 cases from the clinic, and in Martin's clinic at Greifswald, where the mucosa is examined as a matter of routine, in some 1,500 cases tuberculosis was found 24 times.

CASES.

Hofbauer reported a case in a woman of 57. The patient felt well until the preceding few months, when she noticed loss of appetite and weight. There had been a whitish discharge, without odor, but at times mixed with blood; no pain or feeling of weight. The uterus was enlarged, the mucosa covered with granulations containing tubercles and giant cells.

In Frank's case, in a virgin of 21, there was tuberculosis of the uterus secondary to lesions of the lungs. The patient complained merely of amenorrhea.

Von Hauschka narrates what he believes to be a case of primary uterine tuberculosis. A patient of 18 had profuse leucorrhea, and the attending physician, believing it to be due to metritis, curetted away much yellow caseous material and pus. She was then removed to the hospital and a hysterectomy performed. The uterus was en-

larged, the mucosa was infiltrated with tubercles extending into the muscularis, but not reaching the serosa. The mucosa of the tubes was also involved, the ovaries, apart from some follicular degeneration, were healthy, and the peritoneum and intestines were free from disease. Recovery. As a careful examination failed to show any signs of tuberculosis elsewhere, the author believes he is justified in his opinion that this was a case of primary uterine tuberculosis.

PATHOGENY.

Since the observations of Pozzi and Walther uterine tuberculosis has been divided into three varieties: miliary, ulcerative and pyometra (mixed infection). Stolper, however, claims that these are but stages of the same process and that they may all be present at the same time. It can readily be seen that the ulcerative form may occlude the cervix, giving rise to hydrometra, and eventually (from secondary infection) to pyometra (Frerichs, Orthmann, Krziwcki).

In practically all the published cases the lesion in the uterus is secondary to one in the tubes, hence the portion of the organ about the orifices of the latter is most often invaded.

The frequency with which the uterus is involved, compared with the tubes, is attributed by various authors to the changes incident to menstruation. Stolper agrees with this, and states that it is apparently confirmed by the fact that tuberculosis of the fundus is much more frequent before puberty and after the menopause. Sippel points out that the mucous lining of the tubes with the numerous folds is much better fitted as a lodging place for the bacilli than the smooth uterine mucosa, with a rich glandular secretion and subjected to monthly changes. In childhood the delicate epithelium seems to afford but a limited resistance to the penetration of the bacilli.

The miliary form has been met less frequently than

the others, but no doubt it has often been overlooked on account of the inconspicuous character of the lesions. Small tubercles are scattered over the mucosa; later on ulcers make their appearance and the mucosa may be partly or completely destroyed. In severe cases the mucosa is wanting and its place is taken by granulation tissue. The muscular layer often remains intact for a long time, but in extreme cases it also is partly absorbed, leaving merely a fibrous bag containing thick pus and caseous material.

In our monkey experiment No. 2 it shows that the tubercular process may extend deep into the muscular layer of the uterus into the body of the muscle coat from the peritoneal side, but it does not completely traverse the muscle coat. This would indicate that it is possible that the uterine mucosa might become infected from the peritoneum by direct transmission through the uterine wall. We were unable to find in the literature the report of a postmortem showing this condition in the human, nor was a case reported in which a primary tuberculosis of the uterine mucosa penetrated the muscularis to the peritoneum. So that it is fair to assume that this is at least not a frequent route of transmission, either from the peritoneum to the mucosa, or vice versa.

The uterus may be not at all or but slightly enlarged. Again, it may be considerably increased in size and fluctuate from retention of contents just described. There is, as a rule, some malposition.

Tubercular infection may invade a mucosa which is already diseased. Thus, it has been seen to complicate cancer and ordinary polypoid growths. In 24 cases of uterine tuberculosis in Martin's clinic 3 were complicated by myoma and 1 by cancer.

Concerning the microscopic changes it may be said they are first manifested in the glands. The cells assume a cuboidal shape and the nucleus moves toward the center. These glandular cells proliferate and in

places project as papillæ into the gland lumen, which is frequently entirely obliterated. In the early stages there may be proliferation and metaplasia of the surface epithelium; later on, however, degenerative changes occur, as in the glands. Giant cells may also be observed in the glands, in rare cases, and an infiltration of small round cells has been observed between the proliferating glandular cells.

Associated with the above process is a series of interstitial changes—small-celled infiltration with formation of epithelioid and giant cells. In very acute cases giant cells and inflammatory changes minus the tubercle formation may be the conspicuous changes. The infiltration extends progressively towards the muscularis, the superficial layers of which are involved in the tubercular process. Finally, the entire surface becomes caseated.

RELATIONS TO PREGNANCY AND PARTURITION.

While tuberculosis of the uterus may manifest itself from nine and half months to sixty-four years (Polano). it is more frequent in multiparæ. In 5 out of 6 cases of Polano's the affection, according to the patients, dated back to childbirth. The explanation of this is that during parturition blood vessels rupture, the circulation is interfered with and the formation of thrombi furnishes soil for the tubercle bacilli in the circulation. Again, arteriosclerosis is more common in multiparæ, and this disease of the uterine vessels manifests itself especially at the menopause.

Can pregnancy in a tuberculous uterus go on to full term? From the researches of Kochel and Schmorl we must answer this in the affirmative. Schull, another observer, reports a case in which he found caseous material and tubercle bacilli in a pregnant uterus, the fetus being still alive. That pregnancy in such a uterus is not without danger is shown by Casper's case, in which a pregnant uterus ruptured spontaneously as a result of tubercular softening at the end of the third month.

A tuberculous placenta may give rise to acute miliary tuberculosis, as proven by Ausche's case, where a woman, moribund with phthisis, died three days after childbirth. Tuberculosis was demonstrated in the placenta. The child died 26 days after birth, and the necropsy showed tuberculosis of the liver, spleen, lungs and kidneys. Bacilli were found in all these organs.

Finally, pre-existing tuberculous disease usually lights up during pregnancy and the puerperium, or may first manifest itself at these times, and, as before stated, tuberculosis may give rise to extra-uterine pregnancy.

SYMPTOMS.

There is nothing striking or pathognomonic about these. In short, they may be said to be those of ordinary endometritis. Menstruation may be regular, suppressed (as is so often seen in phthisis), or profuse. As might be supposed, from the disease process occurring in the uterus, a profuse leucorrhea is the rule, but even this is sometimes wanting. The diagnosis in most cases must be cleared up by an examination of the uterine scrapings.

The profuse and intractable leucorrhea of both extremities of life are very frequently due to tuberculosis of the uterine fundus. The persistent and profuse leucorrhea of girls from 4 to 14 years of age occurring rather suddenly and resisting local vaginal treatment, should always be suspected as of tubercular origin, and careful examinations of the leucorrheal discharge should be instituted. If these are negative, curettements should be made to determine the presence of bacilli. At or shortly after the menopause, profuse ichorous irritating leucorrhea, without hemorrhages, should be considered as indicative of tuberculosis of the fundus uteri, and careful microscopic examination of the secretions and curettement products should be made. In an enormous majority of cases these young or aged subjects are allowed to go on for years suffering from a curable dis-

ease, if the diagnosis had been correctly made. It is, however, overlooked or not thought of in most of the cases.

TREATMENT.

This is somewhat unsatisfactory so far, on account both of the difficulties in the way of early diagnosis and of the lack of unanimity among operators as to the proper course to pursue.

Several authors—Sippel, Walther, Halbertsma and Munchmeyer—report cases of recovery from merely curetting. Other operators, among them Doderlein, Schauta, Pozzi and Fehling, look on this procedure as only palliative and not to be resorted to save when the patient's condition will not permit extirpation.

Since spontaneous healing of uterine tuberculosis is unknown, and complete removal by scraping is practically impossible, radical operation seems indicated. If the menopause has not been reached, the possibility of future conceptions must be taken into account. In a few cases hysterectomy has been followed by acute miliary tuberculosis. The vaginal route seems preferable, since there is less interference with the peritoneum. In any event, the tubes and ovaries should be removed at the same time as the uterus. In children, where the resistance to tuberculosis and tendency to repair in all of the tissues is great, hysterectomy should be considered a *dernier ressort,* and only applicable to cases where the most careful and painstaking curettements and zinc cauterizations have failed.

E.—TUBERCULOSIS OF THE FALLOPIAN TUBES.

FREQUENCY.

This is by far the most frequent variety of genital tuberculosis, and is usually bilateral.

Schramm, in a series of 3,386 necropsies on females, found tuberculosis of the tubes reported in 34. Von Winckel, in a similar series of 575 necropsies, found 5 cases, and Donhoff, in 509 necropsies, 14 cases.

Frerichs, in 76 necropsies on tuberculous women, found the tubes involved in 12, and Von Rosthorn (Vienna), in 40 necropsies on tuberculous women, found the tubes involved in 2.

In 620 cases of salpingitis, observed by Martin, 17 were tubercular; in 103 by Von Rosthorn (Prague), 5 were tubercular; and in 91, by Williams, 7 were tubercular.

CASES.

Maas, in reporting a case of tubal tuberculosis in a child, directs attention to the infrequency with which it occurs in the tubes at this age, while common elsewhere. After searching the literature carefully, he found but seven cases, his own making the eighth. The latter was in a 5-year-old girl, dying of general tuberculosis. There were tubercular ulcers on the mucosa of the uterus and tubes; the muscularis of the former was normal; that of the tubes was filled with tubercular nodules. The ovaries were normal. The author remarks that the source of infection here was very obscure; coitus, unclean instruments, etc., could be excluded; besides, the vagina was not involved. Old fibrous tubercles were found along adhesions extending from the umbilicus inward to the parietal peritoneum, and he believes the umbilicus was the portal of entrance for the infection.

The case cited at the end of this chapter illustrates a common type of tuberculosis of the tubes in children and the results that can be secured by the conservative treatment.

Kraus gives details of an extremely interesting case in a multipara of 30, with a history of appendicitis 10 years before. A tumor was palpable in the Douglas pouch, which proved to be an enlarged ovary, and a tubercular tube and vermiform appendix. The tubercles were confined to the distal end of the fallopian tube and the adherent tip of the vermiform appendix. There was an ovarian abscess, but no tubercles could be discovered in this organ. This author believes the disease process began in the appendix and extended to the fallopian tube, possibly along the appendiculo-ovarian ligament.

Kundrat states that in 140 hysterectomies at the Göttingen clinic during three years, tuberculosis of the tubes was found four times:

1. Nullipara of 22; family history of tuberculosis and scars of suppurating cervical glands.

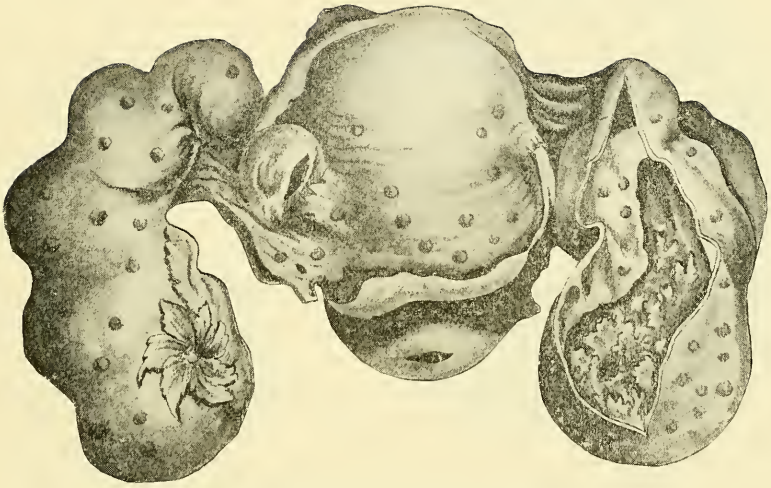
2. Multipara (9 births), 43 years old; treated for a long time for tubercular peritonitis.

3. Multipara (4 births, 2 abortions), 31 years old; the disease began after childbirth, and, as a most complete examination failed to reveal any other focus, Kundrat believed this to be a case of primary tubal tuberculosis.

4. Multipara of 36 years; this case is very unique, in that there was a cancer of the cervix coexisting with tubercular salpingitis.

PATHOGENY.

As Hegar pointed out some years ago, the tubes are predisposed to tuberculosis by their spiral form and pleated mucosa, which favor stagnation of secretions. A preliminary catarrh seems to enhance the dangers of infection. The sources of the latter are numerous—from the peritoneum, through the blood or lymph ves-



Tubal tuberculosis, with ends closed.

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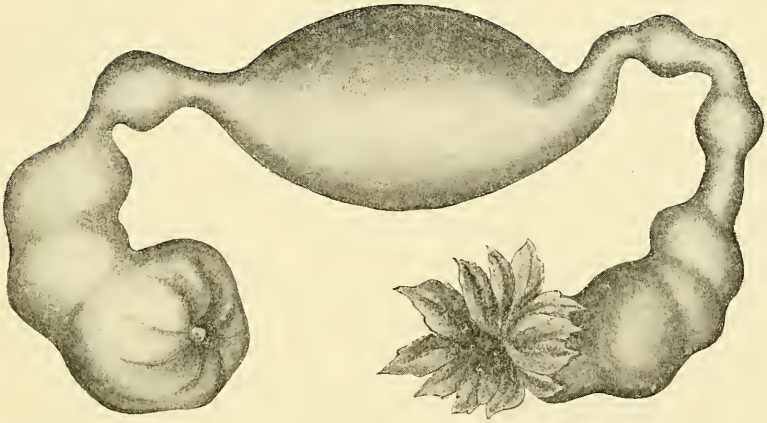


Tubal tuberculosis, with one end closed and the other open.

sels, and from outside the body. In our opinion the normal constriction and valves of the tube about 5/8 inch from the uterus favors the arrest of bacilli at this point. Clinically, this is the most frequent area involved, and the pathologic changes indicate that it is the primary focus in the tube. It is also at this point that the gonococcus infection is arrested and retained sufficiently long to destroy the mucosa and produce the stricture, which is the most prominent etiologic factor of gonorrheal pyosalpinx.

Pinner's experiments show that fine particles, such as lamp-black or vermilion, introduced into the abdominal cavity, find their way through the tubes into the uterus. We might *a priori* expect the tubercle bacilli to be similarly transported, and no doubt they are in some cases. However, in numerous instances the peritoneum is free from tubercular lesions; again, the latter may be extensively diseased and yet the tubes not be involved, as illustrated by the following case:

Mrs. B. McW., housewife, aged 23. Admitted to Mercy Hospital Aug. 17, 1903.

Family History.—Negative.

Personal History.—Has been married two years; never pregnant. Menstruation began at 15; was regular, lasted four or five days; not painful until after present trouble began. Health has always been good. Weight, 144 pounds.

Present Illness.—Two years ago last July (July, 1901) patient was attacked with a sudden and severe pain in the right lower abdomen. It was accompanied by nausea and shortly followed by elevation of temperature. There was great sensitiveness in the right iliac region. With the onset of the pain patient had a constant desire to urinate, and when she did the quantity was small and it caused great pain and burning. The pain in the abdomen, which was cramping in the beginning, gradually subsided to a dull, aching pain, and persisted for one week. Urinary irritation lasted the same length of time. She had to be catheterized a number of times. The vomiting lasted but two days. The bowels were constipated for a week. The patient gradually recovered from the soreness in the abdomen, but she never felt "quite well" after that date. Two months later she had a similar attack, accompanied by vomiting, but not by the urinary irritation. This attack lasted about a week; since then she has had similar

attacks every month or two, not always accompanied by vomiting. Occasionally the pain, during the attack, was felt in the left lower abdominal region. The last attack came on a week ago. This was more mild than usual. During the attack she felt most of the pain on the left side, with some soreness on the right. There was no nausea nor vomiting with this attack.

Since July, 1901, patient has had cramp-like pains during menstruation; otherwise the menstruation has been the same as previous to this attack, both in duration and quantity. There is an absence of leucorrhea.

Operation.—Appendix removed and found enlarged; covered with tubercles on the outer surface, but not perforated. It was not fixed by adhesions to the caput coli. It was about twice its normal diameter and its wall was infiltrated. Whether this was from the infection from within or from the tubercular infection from without it was impossible to say. There was no tuberculosis of its mucosa.

Median incision was then made and both tubes removed. They were both constricted by a firm band at the base of the fimbriæ. This constriction would only admit the finest probe. It was not a complete organic stricture. The tubes were enlarged about 50 per cent. There were no tubercular nodules discernible and no areas of infiltration on the mucosa. The end of the right tube was more firmly contracted than the left and a few of the fimbriæ were adherent and turned in. They presented the appearance of a wheat sack where the string is tied on the end. This is a characteristic appearance where the tube is free in the peritoneum and not infected with the tubercular material.

Microscopic examination of the tube showed a number of classic tubercles on the peritoneal surface. There was no evidence of tuberculosis either on the surface of the fimbriæ or on the mucosa of the tube. The constriction at the base of the fimbriæ to occlusion was due to an extensive deposit of connective tissue at the base of the fimbria. Why this tissue was deposited I will not attempt to explain, but it is a classic condition and appears to be a result of reflex contraction of the tube as a primary condition and secondary cicatricial and peritubal infiltration and fixation. The contracting bands appear in the peritoneal and subperitoneal tissue and not on the mucous side. Is this the result of the effort of the tube to prevent the admission of the tubercle into the tube, or is it a favorite location for peritubal infiltration? It appears to me as the former, it being such a classic pathologic condition.

The abdomen was closed without drainage and patient made an uneventful recovery.

In only a few cases of tubercular peritonitis in our experience, in which the fimbriated end of the tube was

free, was there an absence of tuberculosis of the tube, and in these cases there were annular occlusions of the tubes at the base of the fimbriæ. Often the tube on the other side had its fimbriated end closed. When the fimbriated end is sealed and the infection is a descending one, from the peritoneum primarily, it can be seen that the tubes should be free from tuberculous disease.

EXPERIMENTS ON MONKEYS.

In order to demonstrate that the disease is transferred from the peritoneum to the tubes, the following experiments were performed on monkeys:

Monkeys were selected, first, for their well-known susceptibility to tuberculous infection; second, because their bodies are erect, more like the human, thus tending to the accumulations of peritoneal pathologic products in the pelvis, and, third, because the genital organs, that is, the tubes, ovaries and uterus, in their anatomic conformation, are like miniature human organs.

MONKEY No. 1.—Female. First operation Oct. 8, 1902. Peritoneal cavity opened and a healthy ovary, removed from Mrs. M., transplanted in and on right broad ligament. The ovary had been removed thirty minutes before transplantation and kept in warm normal saline solution. It was split longitudinally through half its thickness and placed on the edge of the broad ligament, with half put under the peritoneum through an incision. Secured in position with a few fine catgut sutures. Abdominal wound closed in layers with catgut and skin approximated with subcutaneous catgut. Primary union followed.

Second Operation.—Nov. 8, 1902. Abdomen opened through scar of first operation. (*a*) Ovary found firmly attached to right broad ligament in position in which it was placed at first operation. Surface of ovary was of a grayish-white color and showed evidence of blood circulation. It was separated from broad ligament and hemorrhage followed the separation. Adhesion to ligament was evidently organic; the ovary bled when incised and looked normal. Ovary submitted to microscopic examination by Professor Zeit and pronounced normal in every respect. (*b*) On this date, November 8, the abdomen of this monkey was infected with an emulsion of caseous tubercular cervical glands, removed from Miss H. S. an hour previously. It was injected into the peritoneal cavity and wound closed as in first operation. The emulsion was made by

triturating the fresh glands with equal parts of glycerin and water. Primary union followed. Monkey died Dec. 2, 1902.

Postmortem examination, made by Dr. W. A. Evans, showed the following: "The body is that of a small rhesus monkey; female. It is quite badly decomposed. There is no evidence of tuberculosis in any of the thoracic viscera. The peritoneum shows most extensive tuberculosis. The omentum is diffusely thickened and yellow tubercle nodules are very abundant throughout. There are no naked-eye tubercles in the liver, the spleen or the kidneys. There is little evidence of tuberculosis in any of the structures in the upper part of the abdominal cavity. The picture is different in the lower part, where everything is in a solid mat. There is a moderate accumulation of fluid in the peritoneum. The intestines show no tubercular lesions in the mucosa that can be recognized by the unaided eye. The bladder mucous membrane shows no breaks. The wall is thrown into multiform projections. Sections were made of these. The uterus and tubes are imbedded in masses of tubercle tissue. Sections were made of the uterus and tubes. It is very apparent that tubercle infection occurring in any portion of the abdominal cavity of the female monkey tends to more exaggerated expression in the pelvic peritoneum. The same is true in the human, except so far as the omentum is concerned. It, when infected, becomes a thickened mass with caseous nodules and much connective tissue infiltration. A section of the right fallopian tube at the uterine horn shows no evidence of tuberculosis. There is no lymphoid hyperplasia. The epithelium is piled up in more layers than is usual in the human subject. There is a much simpler arrangement of the arborization, simple, non-branching papillary projections being the rule. In the underlying tissue we find no giant cells, no focal necrosis and no great connective tissue hyperplasia."

We conclude that the tubercular infection did not enter the tube and uterus from the fimbriated end.

Monkey No. 2.—Female. Operation No. 1, Jan. 21, 1903. Peritoneal cavity opened. Small portions of a carcinoma colloides of the peritoneum (Zeit), which had been removed from the omentum of Mr. C. H. K., thirty minutes previously, together with several drams of ascitic fluid from the same case, were placed in the peritoneal cavity. Wound closed as in monkey No. 1. Primary union followed.

Operation No. 2 on the same monkey, April 25, 1903. Abdomen opened through scar. (*a*) Scattered over the visceral peritoneum and omentum were small nodules about ⅛ inch in diameter, six or seven in all. These were imbedded in the tissue and showed no inflammatory reaction around them. Three of them contained small worm-like bodies, round, white and curled in half circles. The other nodules were grayish-

white; no fluid in peritoneal cavity. Peritoneum elsewhere normal. Several nodules removed for examination.

Microscopic examination showed no evidence of perpetuation of the malignant growth. Two kinds of solid tissues were found. No. 1, the rolls above referred to, consists of heavy fibrous tissue, that has undergone hyaline infiltration; in the center of some of these is illy-defined tissue which take a diffuse blue mist hematoxylin. This may have been and probably was the original inoculating material, now undergoing degeneration. No. 2, lymph nodes, new and of various sizes (Evans).

April 26, 1903, after removing specimens above mentioned, from the monkey, small pieces of triturated tubercular glands, removed one hour previously, were placed in the peritoneal cavity, together with several drams of emulsion of glands in sterile water. Wound closed as usual. Primary union followed. Glands were removed from neck of J. F. McD. Monkey died June 7, 1903.

Postmortem examination by Dr. W. A. Evans showed: This is a badly decomposed female monkey of the rhesus variety. Postmortem examination shows the thoracic viscera negative as to tuberculosis. The peritoneum contains an excess of fluid. The omentum is a thick hyperplastic mass and is closely adherent to the pelvic structures. No nodules are to be found in the liver. There are a few nodules, from the size of a pinhead to that of a pea in the spleen. The kidneys are negative. There are a few tubercular nodules in the peritoneum. The enteric folds show a few nodules, but there are very few adhesions anywhere in this region. The colon also shows a few nodules, but no adhesions. We strip the entire abdominal and pelvic contents from the wall and remove it *en masse*. Posteriorly, in the upper areas, there are a few glands; these are small, showing that the *subperitoneal glands become infected from the peritoneum*. In the lower abdominal segment and in the region of the pelvic viscera the lymph glands are very large and distinctly tubercular. The pelvic viscera are matted together in a solid tubercular mass. The bladder mucosa shows no breaks. The bladder function necessarily was greatly interfered with by the extensive tubercular hyperplasia of all the surrounding structures. Section was made on the left side so as to show in the same slide some of the uterine mucous membrane and that of the fallopian tube, these, to the unaided eye, did not seem tubercular."

This specimen confirms the others in that it shows the tendency of tubercular infection of the general peritoneal cavity to locate in the pelvis in the female monkey.

Sections of the bladder wall show that the mucosa is piled up by muscular contraction. There is no tuber-

culosis in the mucosa nor in the muscular tunic. *Even with extensive pericystic tuberculosis, the bladder wall resists invasion.*

A section of the uterine and fallopian tube walls shows that there is no tuberculosis in the mucosa of either. The muscular tunics are not involved, though there are tubercles of the caseating type on the serous coat, showing that the muscular wall is not attacked from the serosa, either in the uterus or tube.

A transverse section of the uterus shows the following: The mucosa consists of glands and lymphatic tissue in about the same proportion as in the human subject. The glands are of the same structure as in the human subject. There are no evidences of any pathologic processes in this mucosa. External to this is the muscular coat, containing more cells than normal, but with no histology that suggests tuberculosis. Still external to this is a thin circular layer of fibers; this frequently serves as a boundary. External to it are tubercles that show all the histology of tubercular nodules. These nodules are usually caseated. In certain areas the tubercular process is extending from the periphery across this circular boundary layer and into the body of the muscle coat. It does not completely traverse the muscle of the uterus in any portions of our section.

Monkey No. 3.—Female. Operation, April 25, 1903. Small pieces of tubercular gland and several drams of emulsion of gland in water placed in peritoneal cavity. Glands removed one hour previously from the neck of J. F. McD. Wound closed as in monkey No. 1. Primary union followed. Monkey died June 11, 1903.

Postmortem examination by Dr. W. A. Evans showed: "The pathologic findings in this experiment showed diffuse coalescent tuberculosis of the peritoneum, involving the entire lower half of the abdomen. There were many adhesions. The tubes, uterus and pelvic peritoneum were matted. The fimbriated ends of the tubes were sealed with the general adhesions. A careful microscopic examination of the mucosa of the tubes and uterus failed to reveal any evidence of tuberculosis."

The peritoneum and walls of the viscera in this ex-

periment showed a more destructive attack by the tubercular process, that is, the peritoneum was of the ulcerative and adhesive variety, rather than of the serous variety, notwithstanding it was the same material taken from the same trituration and practically the same quantity as that in monkey No. 2. This shows that infections of the same virulence and type may produce different tissue changes; and, in this case, we feel we are justified in attributing this difference in degree of destruction to the difference in resistance afforded by individual monkeys. These results correspond with the clinical manifestations of tuberculosis, not alone in the peritoneum, lung and other tissues, i. e., the destructive effect of a tuberculous infection depends rather on the power of resistance than on the special virulence of the infection.

GENERAL COMMENTS ON MONKEY EXPERIMENTS.

These experiments were undertaken to determine (*a*) what portion of the peritoneum would be most surely attacked with tuberculous material, placed in the middle of the abdomen; (*b*) what lymphatics would take up the tuberculous material and what glands would arrest it; (*c*) would the bacilli be taken up by the tubes, and would the mucosa of the tubes, uterus, or vagina become infected through this route; (*d*) would the tuberculous infection of the peritoneum produce a destruction of the walls of the abdominal viscera through to their mucosa; (*e*) would tuberculous material placed in the abdomen be carried by the general tendency of the lymph current in the direction of the diaphragm, or would it settle in the most dependent portion of the abdomen in the monkey, as it appears to do in the human, regardless of the position in which it is primarily placed in the peritoneal cavity; (*f*) would the tuberculous material be taken from the peritoneum through the intestinal walls by ulceration into the lacteals and thence to the thoracic duct and be arrested in the lung, it being the first filter;

(*g*) would the bacilli find entrance into the portal circulation and be arrested in the liver.

(*a*) It can be seen from the postmortem reports that the pelvic peritoneum bore the blunt of the attack, almost to the exclusion of the diaphragmatic area and the upper abdominal viscera.

(*b*) The retroperitoneal glands of the pelvis and the postperitoneal glands in the lumbar region were the only glands involved; the mediastinal and postgastric glands were not infected.

(*c*) The mucosa of the tubes were not infected in any of these cases nor was the mucosa of the uterus. This would tend to show that in the monkey the tubes do not take up the tubercle bacilli, or if they do the bacilli do not find lodgement on these mucous layers. This may possibly be due to the severity of the tuberculous process produced in this manner, causing primary occlusion by adhesion of the fimbriated ends of the tubes, thus preventing the entrance of bacilli into the tubes, and I feel that this is an important factor against the involvement of the tubes, that does not exist clinically in many cases in the human.

(*d*) The tuberculous process destroyed the peritoneum, the intestines, uterus and bladder; in the uterus it extended quite deep into the muscularis, but in none of them did it penetrate clear through the walls.

(*e*) Tubercular products placed in the peritoneum of the monkey settle into the pelvis, and are not carried by the lymph current and intestinal peristalsis in the direction of the diaphram.

(*f*) The lung was not tuberculous in any of the cases, as evidence against this mode of metastasis.

(*g*) In experiment No. 3 it may be noted that there was no infection of the liver, but there was a number of miliary deposits in the spleen. It is difficult to say how these arrived in the spleen, but most likely the infection of the spleen was hematogenous, as the

tubercles were scattered throughout the spleen and not in its surface, and that there were no transmissions through the portal circulation to the liver.

From the experiments of MacCallum (*Johns Hopkins Bulletin*) it would be inferred that all foreign material placed in the peritoneal cavity moved in the direction of the diaphragm. In our experiments, the tubercular material settled into the pelvis, and only here and there was there a nodule formed above the level of the umbilicus. This corresponds also with our clinical observations in tuberculosis of women, the disease in an enormous majority of cases being below the level of the umbilicus. In men, however, the omentum is more frequently attacked, though the pelvis of the male often shows the most advanced, and often the only, intra-abdominal involvement.

PATH OF INFECTION.

Some evidence in favor of the hematogenous route is furnished by Schöttlander's experiments. This observer, after injuring the fimbriated extremities of the tube in rabbits, injected tubercle bacilli into the circulation, and found tubercular changes follow in the abdominal end of the tube. He is of the opinion that this mode of carriage is frequent, and that the ascending form, through the uterus, is rare. In this connection, Amann points out that the blood supply to the tube may be of some etiologic importance. The ascending branch of the uterine artery at the base of the broad ligament gives off a principal branch, the ovarian (anastomosing with the ovarian artery), and an accessory branch, the tubal artery. From the ovarian artery, two small branches are given off to the fimbriæ and abdominal end of the tube. Now the blood pressure from the heart to the small arterioles diminishes but slightly, being as 6:5 (Jacobson); in the capillaries, however, according to Donders, the pressure is but half that in the large arteries. The territory between the tubal network of the uterine artery

and that of the ovarian artery is very poorly nourished. That the infection of the tubes, uterus and vagina may occur, independent of transmission from below, is proven by the cases of tuberculosis of the tubes, uterus and vagina in imperforate hymen, cited above.

Glimme asserts that the chief avenue of external infection is coitus with tuberculous men. In children and others, with hymen intact, infection must, of necessity, be looked on as coming from the peritoneum. Marchesi, reporting a case of primary tubal tuberculosis in a girl of 19, believed that in his case direct external infection took place and that powdered tubercular material, dust, etc., may enter the genitals of children. In one of Menge's cases, a woman, six weeks after marrying a tuberculous man, had symptoms of inflamed appendages with pelvic peritonitis. Constitutional symptoms of tuberculosis developed so the diseased tube had to be removed.

Other etiologic factors may enter into the case; thus, while symbiosis between the gonococcus and ordinary microbes is rare, according to Menge (quoted by Amann), it is not exceptional to see this occur between Neisser's coccus and the tubercle bacillus. If the two germs penetrate simultaneously, since the gonococcus grows more rapidly than the tubercle bacillus, the soil for the latter will not be favorable. Schuchardt found tubercle bacilli in the secretions of two out of six cases of gonorrhea in males. Williams and Saulmann have also demonstrated the simultaneous presence, in the tubes, of tubercle bacilli and gonococci. Zweifel operated on a case in which gonorrheal pyosalpinx was present at the same time as tubercular peritonitis.

Another very potent predisposing factor, as Amann points out, is hypoplasia of the genital tract, first mentioned by L. Voit. In three cases of genital tuberculosis, Hegar and Alterthum found one case of hypoplasia of the uterus, one case of infantile uterus, as well as a

tendency to bicornate uterus. Landouzy and Fournier (quoted by Hegar) have often found vices of development in the descendants of tuberculous families. Merletti, in 500 necropsies on tuberculous women, found 80 cases of uterine hypoplasia (35 infantile uterus, 2 bifid uterus, and 43 small uterus), and in 24 out of these cases, genital tuberculosis existed. This author considers hypoplasia as a necessary consequence of the cardiovascular hypoplasia so frequent in the tuberculous with hereditary disease. In order to give an idea of the frequency of hypoplasia in the tuberculous, Merletti reports that of 549 patients examined during the year at Parma, Italy, uterine hypoplasia was found 17 times (3.01 per cent.), and of 353 patients examined at Padua, uterine hypoplasia was found 36 times (10.2 per cent.). The latter city is noted for its numerous cases of tuberculosis. This observer believes that uterine hypoplasia predisposed to tubercular infection by favoring stagnation of the secretions. Tillaux and other observers have shown that in the male also, genital tuberculosis is often accompanied by an infantile condition of the prostate, penis and testicle. This is corroborated by Merletti, who, in 34 cases of tuberculosis of the male organs, found poor development of the prostate, evidently congenital, in 5, and ectopia of the testis in 4.

The puerperal state plays as important a rôle in tuberculosis of the tubes as it does in tubercular diseases of the genital tract.

Lastly, tubercular infection of a hydrosalpinx may occur (Schroeder's case from Fritsch's clinic).

In ascending infection, why does the tube become involved, while the intermediate portions of the genital tract—vulva, vagina, cervix and fundus uteri—escape? The answer is the same as that for the well-known immunity of the nose and upper air passages in pulmonary tuberculosis—the resisting power of these intervening structures is greater.

PATHOLOGIC ANATOMY.

With Martin and Rosthorn, we may divide tubal tuberculosis into an acute secondary and a chronic primary form. The former is characterized by round-cell infiltration, few or no giant cells, and an abundance of bacteria. The mucosa in this form is rapidly necrosed. In the other form—the chronic primary—the mucosa remains unaltered for a long time, at least in spots, though swelling is very marked; tubercle bacilli, either absent or few in number; the abdominal end of the tube is frequently sealed up by adhesions, and the serosa covered with miliary granulations in the beginning.

The tubes, as a rule, are enlarged, moderately firm in consistency and the serous covering thickened. They may be covered with false membrane in which nodules may be noticed. The caliber usually enlarges toward the abdominal end (cornucopia shaped); the fimbriæ swollen and frequently with nodular thickenings. The abdominal opening may be patent, partly closed with a caseous plug protruding from it, or impermeable. In this latter event, a pyosalpinx rapidly forms, which may reach enormous proportions (two liters, Stehmann). If the fimbriated end is open, which is often the case; if its walls are infiltrated with a non-mixed infection, caseous débris is discharged into the peritoneal cavity. As the tube frequently contracts adhesions to the adjoining viscera, cavities may be formed into which these masses are emptied, or become encysted. Finally, by the adhesion of the false membranes to the tube and the viscera, everything is matted together into one mass.

NODULE AND CYST FORMATION.

The isthmus may be free from any marked changes, especially in the descending variety, or it may exhibit nodule formation. The latter was looked on by Hegar as pathognomonic of tuberculosis, but this is now known to be unfounded. A similar nodular salpingitis of the isthmus is found in chronic gonorrhea. Its origin has

been variously interpreted. Rokitansky, Klebs and others believed the nodules to be small myomata. Chiari thought they were due to hypertrophy of the tubal muscularis. Finally, Amann claims that in nearly, if not all, cases there are remnants of the Wolffian ducts, and Schauta, that, on account of the narrow lumen of the isthmus, the inflamed, swollen mucosa projects into the muscularis, causing hypertrophy of the latter.

These nodes themselves may contain cystic spaces and the folds of the mucosa in the tube proper may adhere to each other, also giving rise to cysts.

PATHOLOGIC HISTOLOGY.

In the beginning we find cloudy swelling of the epithelium; the folds of the mucosa are richly infiltrated with round cells, are very vascular, and thickened with tubercles and giant cells. The muscular layer is free from changes. Later the epithelium exhibits degenerative changes and finally disappears. Necrosis manifests itself, usually in the tubercles at first; finally, necrotic changes and caseation occur through the infiltrated mucosa. The muscularis is now infiltrated and may contain tubercles; atropic changes are common, and newly-formed connective tissue has been observed in the muscularis a few times.

A few cases are on record in which the necrosis and caseation involved all the coats of the tube, leading to rupture and escape of the contents into the ovary, as shown in Miss N.'s history, cited under tubercular abscess in ovary. Calcification is occasionally, though rarely, seen, and various stages in the tubercular process may be visible in the same tube. The changes about the ostium abdominale are nearly always more marked than elsewhere in the tube, except near the cornu, and this is the principal point relied on by the advocates of the peritoneum being the source of infection.

SYMPTOMS AND DIAGNOSIS.

As the symptoms of uterine tuberculosis are prac-

tically those of endometritis, so the symptoms of tubal tuberculosis are those of salpingitis, in general, to which are added those of frequent pelvic peritonitis. Pain is more constant than in any of the varieties of genital tuberculosis considered thus far. It is periodical, localized, though at times diffused, and is usually the reason for which professional advice is sought. Menstrual disturbances are not noticeable. Attention is called by some writers, especially Polano, to a rise in temperature characteristic of this variety. In three of his cases these was a regular remittent fever, the morning temperature being about normal, the evening rising to 100.4 F.

Alterthum lays stress on the value of nodules palpable through the vagina or rectum. These vary in size from a pinhead up to a bean, or larger, and are located in the Douglas cul-de-sac on the posterior aspect of the broad ligament, the posterior wall of the pelvis, or in the paravaginal tissues. They are usually firm and are sometimes situated so close together that they give the finger the impression of a coarse rasp. Bulius corroborates the value of this sign, but adds that localized thickening at the isthmus is, as a rule, of gonorrheal origin.

In the cases of simple tuberculous infection of the tube, in which the fimbriated end is not adherent, which is the rule, there is a pronounced periodicity in the acts, accompanied by all of the manifestations of an acute infection of the pelvic peritoneum, viz., soreness, pain, nausea and often vomiting, elevation of temperature from 100 to 102 F., evidence of fluid accumulation in the pelvic peritoneum, great sensitiveness on vaginal examination, with "boggy" sensation of the Douglas fold. This is very pronounced on rectal examination. The uterus and tubes are more movable than in gonorrheal salpingitis. The attack passes off in a week or ten days, to recur in three to six weeks. This periodic pelvic peritonitis, as I have demonstrated in operations,

is due to the expulsion of tubercular débris from the tubes into the peritoneum. Unless one is careful in the analysis of the clinical history to note that the soreness precedes the pain, which is never the case in acute appendicitis, the case may be mistaken for one of recurrent appendiceal pelvic infection. The leucocytosis in these attacks is about the same as in pelvic peritonitis of other origin, varying from 12,000 to 18,000. I have never seen this pronounced periodicity except in the cases where the fimbriated end of one or both tubes was free, as illustrated in the following history:

Miss F. B., aged 26. Admitted to Mercy Hospital Sept. 21, 1900.

Family History.—Negative.

Personal History.—No previous illness except a vaginal discharge, which has been present as long as she can remember. This discharge was white and mucoid until lately, when it became bloody, for which she sought treatment. During the last two years she has had pain in the region of the ovaries, confined principally to the right side; also pain in the back.

Present Illness.—Eighteen months ago she had an attack of acute severe pain in the lower half of the abdomen. She does not remember whether it was more on the right or left side. A few hours after the onset of pain patient vomited and there was a decided elevation of temperature. The lower half of the abdomen was sensitive to pressure; there was some bloating; the doctor did not state that there was fluid in the peritoneal cavity.

The attack subsided in ten days, but from that time she has had considerable soreness when she exercises or works hard.

She has had in all five similar attacks, all of about equal severity and lasting about the same length of time. In one of these attacks her temperature reached 103, and the physician said there was a mass in the lower right side of the abdomen. This attack was more protracted than the others.

The last attack was five weeks ago. She has completely recovered from this.

Examination.—Increased resistance over the lower abdomen on both sides. The sensitiveness, however, is more marked on the right side of the pelvis than the left.

Bimanual examination reveals a moderately fixed uterus; stiffened, but not infiltrated fornices, an increased resistance in the Douglas cul-de-sac, with a nodular mass on the right side. The rectal fold of peritoneum is particularly sensitive and

thickened. The tubes could be outlined as enlarged and fixed. The uterine discharge was not examined for tubercle bacilli, nor were inoculations made to determine the presence of tuberculosis.

Operation.—Incision through left rectus. Peritoneum congested; great vascularity on both parietal and visceral layers; considerable serous fluid. The tubes were adherent to the wall of the pelvis, but easily detached. Some soft, slimy adhesions between the intestines; appendix free from disease. One-half inch from the uterine cornua in each tube was found a firm caseous mass; secondary masses were located at intervals of one-half to one inch out to the extremities; there was edema and ectropion of the fimbriæ and beneath the mucosa of the fimbriæ could be seen small white tuberculous foci; caseous masses protruded from the ends of the tubes. In the Douglas pouch the tubercles were confluent; they diminished in frequency as the distance from the end of the tube increased. A few small deposits were found on the surface of the omentum. The tubercles were well defined and surrounded by rings of connective tissue, showing that the tissue was overcoming and encapsulating the tubercular infection. The tubes were removed; ovaries retained; small tubercles were studded here and there on the surface of the ovary, but none of the graafian follicles were infected with tuberculosis as far as could be seen. The tubes were removed close to the uterine cornua on the proximal side of the primary and most compact tuberculous nodule. The uterine cornua was not removed. The uterus was normal in size and showed no evidence of tuberculosis. The abdomen was thoroughly sponged and a rubber drain was allowed to remain for 48 hours. (This was a mistake, and led to the formation of a ventral hernia, for which I operated June 28, 1901.) On this date, ten months after the first operation, the abdomen was opened, the hernial sac incised and a careful examination was made of the abdominal contents. Every vestige and manifestation of tuberculosis had disappeared. There were no adhesions; there were no enlarged glands; the stumps of the tubes could be recognized, covered over by cicatricial tissue. The ovaries were normal; the uterus was about the same size as when previously seen. In fact, the peritoneum appeared as a normal peritoneum, and one could scarcely believe without seeing that such complete restoration of the peritoneum could take place after tuberculosis.

This is a striking case, as showing the power of the peritoneum to repair, after the source of supply of the tuberculous material is shut off, namely, the removal of the tube with its tuberculous mucosa. The mucosa of the tube containing it reproduces tubercle and bears

it into the peritoneal cavity, through the open fimbriated end.

June, 1903, patient seen for another illness and states that she has enjoyed perfect health since operation; has had no recurrence of pelvic pain or peritonitis. Menstruation is normal as to time and duration, and is painless.

RELATIONS TO MENSTRUATION AND STERILITY.

The cases of Orthmann and Williams show that tubal tuberculosis, even when bilateral, has no effect on menstruation, provided the uterus itself be healthy. In 5 of Polano's cases, menstruation was regular and not painful; yet the tubes were involved in all 5 and the ovaries in 4.

Sterility seems to be the rule in this variety. Tubal tuberculosis evidently inhibits both ovulation and the ingress of spermatozoa.

TREATMENT.

The only treatment, according to the weight of evidence, is complete extirpation of the tubes, provided the general condition does not contraindicate. The abdominal route is preferable, as a clear view can be had of the diseased area; the diseased peritoneum can also be treated, and the possibility of a serous sinus less likely than by the vaginal route. Most operators advise leaving the ovaries, or at least parts of them, to mitigate the inconveniences of the artificial menopause. Fortunately, this can often be done, since the ovaries are rarely interstitially diseased.

Seeligman reports a case where lupus of the face and scalp of many years' standing healed up after extirpation of a tubercular tubo-ovarian tumor.

The uterus should not be extirpated with the tubes, unless there is pronounced evidence of disease in that organ. The routine removal of the uterus is a pernicious practice. The abdominal route should be the one of election, as the intestines are frequently adherent

to the tube and likely to injury in the separation. This injury would result in a fecal fistula, which, if it did not produce an immediate and fatal result, would be difficult, if not impossible, to repair. If both ovaries contain abscesses, one of them, at least, should be preserved by enucleating the abscess wall out of the ovarian stroma, retaining the latter. This is not so difficult to accomplish as one would imagine, as the tuberculosis in the ovary is usually a single sac, that of a graafian follicle enlarged, and is easily abated.

The reward for the conservation of the uterus and the ovaries is beautifully illustrated in the following case:

Della C., aged 9 years. Came under my observation May 10, 1893. Gave a history of recurrent attacks of inflammation in the pelvis, extending over a period of four months. The last attack began six weeks ago, and since then there has been a rapid accumulation of fluid in the abdomen, so that it is enormously distended. The patient was somewhat emaciated; hectic; the afternoon temperature ranged from 100 to 101.6. She was not particularly sensitive to abdominal pressure. Hymen intact; utero-rectal fold of peritoneum thickened and sensitive. Diagnosis of tuberculous peritonitis made and section advised.

Operation.—May 14. Pelvic peritoneum was studded with miliary tubercles; there were no intestinal adhesions, although the small intestine had here and there many miliary deposits. The tubes were enlarged to about the size of an adult index finger; the fimbriæ were free. The ovaries were not adherent to the tube, although the mesosalpinx was short and held the tube close to the ovary. Both tubes were removed to the cornua; both ovaries and the uterus were retained. This patient has since that time been perfectly well; has developed into a fine young woman. She began to menstruate at 14; has menstruated regularly and without pain or discomfort, and although ten years have elapsed and the operation was performed five years before she arrived at puberty, it had no untoward effect on her development, ovulation and menstruation and nervous system.

This is quite a contrast to the results after the prepuberty "pan" operations so frequently and unnecessarily resorted to at the present time. Drainage or iodoform should not be resorted to after the section in these cases.

F.—TUBERCULOSIS OF THE OVARY.

FREQUENCY.

This variety is apparently relatively infrequent.

Spaeth, in 119 cases of genital tuberculosis, found 15 cases of the ovary (12.6 per cent.). Merletti, in 172 cases of genital tuberculosis, found 27 of the ovary. Orthmann, in 103 cases of genital tuberculosis, found the ovary involved in 33 per cent. The same author collected from various sources 177 cases of ovarian tuberculosis; but 57, however, were confirmed by microscopic examination. Of these 57 absolute diagnoses, 9 were tubercular ovarian cysts and 48 (27 bilateral, 21 unilateral) were tubercular ovaries.

SOURCE OF INFECTION.

The isolated position of the ovary renders the solution of the source of infection of unusual interest. Primary tuberculosis of the ovary is quite unusual. For instance, Schöttlander collected 157 cases, none of which were primary; however, several cases are on record (Oppenheim, Spaeth) in which the focus in the ovary was the only one in the genital organs. According to Wolff, in 60 per cent. of tubal or peritoneal tuberculosis the ovaries are involved also.

There seem to be two sources, the blood current and the fallopian tubes and peritoneum. Hematogenous infection has been proven by Schöttlander's experiments, this observer having been able to produce primary tuberculosis of the ovary in animals. In the human being it is especially likely to occur during the course of acute miliary tuberculosis of the lungs, when large numbers of bacilli gain entrance to the blood stream.

The usual mode of infection, however, is by contiguity, or, in some cases, by the lymphatics. Probably the most frequent source is the peritoneum and tubes.

In the 48 cases of true ovarian tuberculosis collected by Orthmann and verified by microscopic examination, the infection was traced to the tubes in 26 cases and the peritoneum in 22. Schöttlander states that while the peritoneum is the usual source of infection, in some cases the tubes are at fault. According to Wolff, tuberculosis of the peritoneum always spreads to the ovary unless this organ is protected by adhesions.

Schöttlander claims the disease process in the ovary begins as a peri-oöphoritis and that the deeper portions become infected through the lymphatics. During ovulation the periodic rupture of the graafian follicles acts as a mild traumatism and affords an atrium for the invasion of bacilli. In a case of Orthmann's, incision of a corpus luteum located near the fimbriated end of the tube showed tuberculosis. By dissecting up the adhesions he found the fimbriæ were likewise tubercular and extended directly into the corpus luteum. In this case tubercular peritonitis was also present.

In a recent case (Miss M. N. See history of this case below), operated on by me in Mercy Hospital, the communication to the graafian follicle was by direct perforation of the tubal wall, producing in this way a tubo-ovarian tuberculous abscess. The abscess in the ovary was the size of a walnut; its sac was easily shelled out, leaving a comparatively healthy though deformed ovary. In most of the recorded cases of tuberculous abscess of the ovary, when a detail of the pathologic changes is given, the tuberculosis is shown to be either of the peritoneum or the graafian follicle and less frequently in the stroma of the ovary.

PATHOLOGIC ANATOMY.

This resembles somewhat the same process in the analogous organ, the testis. Primary tuberculosis of the testis practically never occurs except in general miliary tuberculosis; according to Fritsch's experiments it does occur in the ovary. Tuberculosis of the testis is

otherwise always secondary to tuberculosis of the epididymis.[1] In the ovary it is frequently secondary to tuberculosis of the peritoneum as well as tuberculosis of the tube.

The disease may manifest itself either as peri-oöphoritis (disseminated or diffused), or as true ovarian tuberculosis. The latter may be either miliary (the least frequent), caseous or tubercular abscess (the two latter occur with equal frequency).

The miliary form is often undetected by the naked-eye appearances, and may escape notice. According to Guilemain, the evolution of the morbid process may be so rapid that it has progressed to caseation, etc., before operation. The disease may remain limited to the periphery for some time, as in three of Wolff's cases there were tubercles superficially, but no caseation. This type sometimes pursues a very mild and chronic course. In the majority of our cases miliary tubercles existed on the surface of the ovary as tuberculosis of the peritoneum and tunica albuginea, showing no tendency to penetrate that membrane to the ovarian stroma.

Caseous foci gradually make their appearance and coalesce. In advanced stages the organ is enlarged, soft, fluctuating, filled with pus and caseous matter. The pus cavities, which sometimes reach the size of an egg, are probably due to secondary infection, since streptococci are frequent in the pus, while tubercle bacilli are absent.

The organ may reach enormous size and yet show no signs of softening, as in a case of von Franque's, in which it reached the size of a fist, and on section was found filled with yellow nodes, the largest the size of a walnut. These nodes were composed of round cells which had partly undergone fatty changes. There were no signs of caseation, but epithelioid and giant cells were seen in the stroma. The tube adhered strongly to the ovary and the abdominal end was impermeable.

1. See article on "Tuberculosis of Testis" by author, THE JOURNAL A. M. A., Nov. 10 to Dec. 8, 1900.

In several cases reported by Penrose and Beyea the parovarium was involved, the first time, according to these authors, that this has been noticed.

Pozzi reports that the right ovary is more often affected than the left, as 5 to 2.

SYMPTOMS.

The cases of primary tuberculosis of the ovary are so few that practically nothing has been learned as to the symptoms. The symptoms in the secondary cases are those of the tubal or peritoneal disease from which it originates.

TREATMENT.

Since ovarian tuberculosis is either discovered accidentally or complicated tuberculosis elsewhere, it will be removed with the diseased tubes or during the treatment of tubercular peritonitis. If both ovaries are involved in young individuals, in many cases the ovary can be conserved by shelling out the tuberculous graafian follicles and closing the rent with a catgut suture. Many of these may be shelled out of the same ovary and the organ be preserved in practically its normal condition; there is no more reason for removing an ovary because a graafian follicle or the tunica albuginea is involved than there is for amputating a leg because there is a tuberculous focus in the tibia, or even a tuberculous genusynovitis.

The ovary has rarely been diffusely involved in the tuberculous process in the cases under our observation. The following is one in which the left ovary was the seat of tuberculous abscess and represents the most frequent type we encounter.

Miss M. N., aged 32. Admitted to Mercy Hospital Aug. 28, 1903. Two months ago patient had an attack of pain in the left lower abdomen. Pain was severe and of a sharp shooting character. Did not vomit, was not nauseated and abdomen was not distended. Temperature was not taken. Bowels constipated at this time, as they always have been. Her physician said she had obstruction of the bowels, and she was in the hospital for ten days, but was not operated on. Since then she

has had occasional soreness in left lower abdomen when she coughs or laughs. General health good; weight normal.

Previous History.—Since five years ago has had quite profuse leucorrhea. Patient gets up once at night to urinate and has a little burning during passage of urine. Has had no serious illnesses. Menstruation normal. No history of venereal infection.

Family History.—One sister died of consumption at 22.

Examination of Patient.—Large stature; well nourished. Temperature 99 F. Heart and lungs negative. Abdomen: some tenderness and flatness in left lower quadrant; no masses or tumor to be felt. Kidneys not palpable.

Pelvic examination reveals a tumor in the left fornix. A mass about three inches in thickness and firmly fixed can be detected by bimanual palpation; some induration and infiltration in the right fornix, with a small resisting mass resembling a tube. The vesicorectal fold and the Douglas pouch are thickened and sensitive. No fluctuation can be detected. The uterus is partially movable; not materially enlarged and displaced to the right. Leucocytosis, 9,000.

Diagnosis.—Left pyosalpinx with ovarian or perisigmoid abscess: enlargement of right tube.

Operation.—August 31. On opening the abdomen the parietal peritoneum was somewhat infiltrated and studded with well-repaired tubercles. The number increased in frequency as the pelvis was approached until, in the latter, they were confluent. In the neighborhood of the umbilicus there was about one to the square inch, and on the intestine and omentum drawn from the upper portion of the abdomen they were absent. There were a few ounces of straw-colored fluid in the cul-de-sac. The right tube was somewhat enlarged with a constriction to occlusion one-half inch from its fimbriated end. The fimbriæ were free. The body of the tube itself was free from adhesions. There was a constriction three-quarters of an inch from the cornu. The dilatation between the two constrictions was supposed to be due to tubercular endosalpingitis. When opened, however, it contained only a mucopurulent fluid with a granular condition of the mucosa, but no tuberculosis. As this tube was closed at its proximal and distal ends, evidently ancient, there was no possibility of infecting it with tubercle bacilli except through the lymphatics or blood. The right ovary was normal and not disturbed. The uterus was free. The mass described in the physical examination was found on the left side resting on the sigmoid and extending from a level with the pelvic brim down the left side of the pelvis wall to its floor. The mass was about two inches long by an inch and a quarter in thickness. The tube entered it above on a level with the fundus. Half way down a coil of small intestine was organically united to it; the

separation was accomplished with difficulty but without perforation. The fimbriated end of the tube was free and everted, with a tubercular ulcer a half inch in diameter on its surface. The ovary and the tube were carefully separated from the sigmoid and removed *en masse*. The tube was as large as an adult thumb and obliterated by a cicatrix at the base of the fimbriæ. The ovary was firmly adherent to the tube and could not be separated without lacerating the wall of the tubercular mass in the ovary. There was a communication between the ovarian abscess and the cheesy mass in the tube. The tuberculosis in the ovary involved a follicle and was the size of a walnut; the tuberculous wall was easily shelled out after the adhesions were removed. The remainder of the ovary was normal. The tube was the size of an adult thumb, and was filled with tubercular débris. The last and most ancient caseous mass was three-quarters of an inch from the cornu.

It seemed clear from the pathologic findings that the tubal lesion was primary; that the wall of the tube ruptured into an adherent follicle, producing the nodule in the ovary. The peritoneum of the sigmoid was destroyed, but there was no perforation found. The tubal stumps were buried beneath the broad ligaments on both sides and the abdomen closed.

The following is a report of the pathologic findings from Dr. W. A. Evans:

"Referring to your specimen of tissue of Miss N., submitted to us on Sept. 3, 1903, we wish to report as follows: The small peritoneal masses are tubercles. They are composed of epithelial cells and lymphocytes in about equal number. There are very few polymorphonuclear leucocytes. There is a distinct disposition to capsule formation around each nodule. A node, less than the size of a pea, is composed of many nodules. There are few giant cells and only a small amount of necrosis. There is an indistinct band of fibers underlying the tubercles. Some of the nodules are partially below this and some are wholly below it, but, generally speaking, they are above it. In the tissue below this band are the fibers underlying the tubercles. Some of the nodules are partially below this and some are wholly below it, but, generally speaking, they are above it. In the tissue below this band the fibers run perpendicular to the surface. Between these bands of perpendicular fibers are strings of cells that split them up. These represent extension of the infection (tubercular) to the underlying tissue."

Further report on the same specimen: "Section 24560-1 is through a dilated portion of a fallopian tube. Seen with the unaided eye peritoneal tubercles appear. In addition there is a somewhat diffuse thickening of the peritoneum. The muscular tunic is not very prominent. The lining coats look necrotic.

"Under magnification: The peritoneum is diffusely thickened.

Above the general peritoneal level nodules rise here and there. In the peritoneum there are islands of large vesicular nucleated round cells. Generally these are in the perivascular spaces of the smaller blood vessels. There are no giant cells. None of the cells show necrosis in the protoplasm. There is a slight leucocytic infiltration. The perivascular spaces of the larger blood vessels are not so affected. The same process, though to a lesser extent, is seen in the muscle tunic.

"In some places, near the muscle tunic, a few slightly dilated glands lined by low columnar or cubical epithelium can be demonstrated. These are usually partly filled with polymorphonuclear leucocytes. Nowhere else do we find any glands or epithelium. The tissue of this region is necrotic tubercular tissue with moderate leucocytic infiltration. There is little or no tendency to organization in this area. There is some evidence in these sections of infection traveling from the fallopian tube mucosa to the peritoneum.

"24560-1 is from fallopian tube at curve, covered by tubercles.

"24560-2 is through abscess.

"24560-3 is through separate piece.

"24560-2. Our sections show a typical tubercle tissue, for example, such as is described under 24560-3. There are giant cells, productive connective tissue, inflammation, focal necrosis, etc.

"24560-3. This is a section through the ovarian abscess wall. Naked-eye examination shows a fallopian tube and its fimbriated extremity. The fimbriæ do not seem to be tubercular. There is no naked-eye appearance of tubercle in the adjacent tube. There are a few small cysts similar to those that form in the tubes of Rosenmüller. Near the tube is an abscess wall. This seems to have an outer fibrous wall and a lining thrown into yellow folds or rows.

"*Microscopic examination* of the wall shows: Externally there is a banded wall with fibers that run circularly. These fibers are open in arrangement, but there are no islands or strands of cells to suggest that the infection was traversing the wall. External is a layer of tubercular granulation tissue. The yellow rows or ridges are due to piling up of this tissue. This tubercle tissue shows a moderate number of giant cells. The ordinary cells are mostly fibroblasts in the spindle-cell stage or even a little older than spindles. There are a moderate number of epithelioid cells. The proportion of reticulum is large. There is but little evidence of necrosis as a general proposition, though here and there are large necrotic islands. This is quite a vascular tubercle tissue.

"We find no tissue elements by which we can verify microscopically the nature of the host tissue, i. e., there are no specific ovarian elements."

G.—TUBERCULOSIS OF THE PERITONEUM.

FREQUENCY.

In 13,422 necropsies the peritoneum was tuberculous in 284 (Grawitz, Brunn).

Age.—While the table collected by Osler shows that most cases occur between 20 and 30 years of age, it may be found at any period. During childhood it is somewhat frequent. Rotch found that in the Children's Hospital of Boston the disease was extremely rare in the first few months, the youngest patient being 14 months old. After the first year and a half of life the disease was found to become frequent and was most common between the ages of 2 and 4, after which it occurred only occasionally.

Sex.—The disease is more common in the female; according to Nothnagel, 90 per cent. of the reported cases are in females. In 382 cases reported by König and others, 251 were in women (78 per cent.), and only 71 in men (28 per cent.).

History.—A tuberculous family, or one of some antecedent lesion, is very noticeable. Thus in Rotch's cases there was a tuberculous family history in 30 per cent. Other authors give a much higher percentage, for example, Brunn, 55 per cent.; Fuller, 60 per cent.; Desplans, 71 per cent.

PATHOGENY AND ETIOLOGY.

The cause is invariably from tubercle bacilli gaining access to the peritoneal cavity. The route, however, by which they reach the peritoneum is frequently difficult or impossible to determine and evidently is not the same for all cases. Dieulafoy believes the most frequent source is the intestine, where they have been introduced in sputum or food (infected milk or meat). The bacilli may attack the intestine first and the peritoneum next,

or, absorbed by the superficial lymphatics of the intestinal mucosa, may attack the peritoneum primarily. This latter hypothesis seems to be confirmed by the experiences of Wesner and Cornil. Again, Dobroklonsky has shown that the bacilli are capable of passing through the walls of the intestine without a primary lesion of the bowel and thus reaching the peritoneum without leaving any trace of trouble at the atrium of invasion, as it does in the pharynx, to infect the cervical glands.

Other sources are the blood current (which is more common in children, though infrequent at any age), the lymph current, especially from the mesenteric glands, the pleura, the stump of the umbilical cord (Veit), and the genito-urinary tract. As a general rule, it may be stated that in males the most common source of infection is the intestine; next, the genito-urinary tract; and in females the genital tract, especially the tubes. A number of cases of tuberculosis of the uterus and cervix have not extended to the tubes, and vice versa, as Von Hauschka's cases.

Any previous condition which tends to weaken the resistance of the peritoneum will act as a predisposing cause, for example, acute peritonitis, pelvic hematocele, enteric fever, and especially the puerperium. Kelly believes the influence of pregnancy and parturition has not been sufficiently recognized.

From a pathologic standpoint four varieties are manifest:

1. Disseminated, exudative, miliary, non-confluent, serous (aseitic) variety.

2. Nodular, ulcerative, or perforative variety; the least frequent variety.

3. Adhesive, fibroplastic, cystic, partition or obliteration variety.

4. Suppurative, circumscribed or general mixed infection.

We have observed clinically the relation of tuberculosis

of the tube and tuberculosis of the peritoneum. The tube has been almost uniformly involved in the tuberculous process, where its fimbriated end was free from adhesions in a tuberculous peritoneum. So common was the condition, clinically, that I believed the tubes were infected from the peritoneum, and to demonstrate this route of infection the experiments on the monkeys, reported above, were undertaken, with the results therein given.

Recently, I had a striking case of tuberculosis of the peritoneum, from a primary tuberculosis of the appendix, with multiple miliary deposits and few adhesions, a considerable quantity of fluid in the pelvis and non-adherent fimbriæ. The tubes were not enlarged and there was no tuberculosis of the tubal mucosa. This case also illustrates the similarity in the clinical history between tuberculous peritonitis from a primary lesion of the appendix and a primary disease of the tubes.

Mrs. N. J. M., Clare, Iowa, aged 27 years. Duration of illness eight months and four days. Admitted to Mercy Hospital Sept. 24, 1903.

Family History.—Mother died of carcinoma. One sister died of tuberculosis.

Previous History.—Only the diseases of childhood, with no recognizable sequelæ, except migraine, which she has had since childhood.

Dec. 28, 1902, patient was suddenly attacked with pain in the abdomen, which was located at the umbilicus. It was intensely severe, requiring a hypodermic of morphin for relief. Four hours after onset patient was nauseated and vomited. The following day the pain gradually settled into the right iliac region. It was then accompanied by marked tenderness. The pain lasted for four days and gradually subsided. The right thigh was flexed on the abdomen and jarring of the bed produced pain. The severity of the symptoms gradually subsided, but the sensitiveness to pressure in the lower half of the abdomen, and particularly in the right iliac fossa, has continued from that time. There was no temperature in this attack. (This is questionable.)

Second attack April 17, 1903. Similar to the first in every particular except of longer duration.

Had a third attack June 26, 1903. The first attack was very

severe and kept her in bed three days; the second, four days, and the third, nine days. From June 26 to the present time the patient has been unable to do her housework; has felt languid; lost some in weight. There is constant soreness in the lower portion of the abdomen.

Menstruation began at 16; occurred about every 30 days; occasionally intervals would be shortened to 27 days and lasted from three to four days. This was not materially changed in the last year. There is no leucorrhea and never has been. Married three years; no pregnancies and no history of pelvic infection.

Present Condition.—Patient is poorly nourished; has a slight hectic flush on cheek; the abdomen is distended; no evidence of fluid; it is "doughy" in its response to pressure; in the lower half it is semi-resonant; in the region of the appendix a small induration can be detected. This is particularly sensitive.

Vaginal examination shows an infiltration of the Douglas pouch. Uterus is movable, though not free. Tubes are not enlarged. The entire pelvic area is hypersensitive. No examination was made of the vaginal secretions, either microscopic or inoculatory, as the patient came to the hospital only 48 hours before operation. Urinary findings negative.

Diagnosis.—Recurrent and chronic appendicitis, with chronic pelvic peritonitis.

Operation.—Sept. 27, 1903. Section. Incision through the middle of the right rectus muscle. The peritoneum was chronically congested and very vascular. Soft cobweb adhesions united the intestines to the parietal peritoneum and to neighboring viscera. The caput coli was free; the appendix was as large as the adult index finger. At its base could be seen a small seropurulent accumulation of a couple of drams. It was encapsulated by a thin transparent membrane, which ruptured on touching. The flocculi and mucoid material escaped. From this sac there was direct communication into the lumen of the appendix. The appendix, on the intestinal side of this opening, was occluded by a granulation mass. A tubercular ulcer amputated the appendix for about two-thirds of its circumference. The pelvic peritoneum had the same web-like adhesions and friable fixation of all of the tissues. (These agglutinations are more like "slimy webs" than adhesions, but the surface of the peritoneum has lost its gloss and is velvety in place of glistening.) The fimbriæ of both tubes were free and there was no enlargement or thickening of the tubes. The peritoneal covering of the tubes and ovaries was studded with miliary tubercles. No ulceration of the peritoneum and no organic adhesions in any position. The uterus was enlarged but in normal situation. The appendix was removed from the wall of the caput coli. There was no

Abscess at end of tube.

thickening of the cecal mucosa. Tubes and ovaries allowed to remain. Abdomen closed.

The left iliac fossa was less involved than the right and the intestines had a smaller number of tubercles, as the distance from the caput coli increased. The jejunum had no tubercles; the omentum also was not involved. It is evident from pathologic findings that there had been ruptures of the thin, friable membrane, which encapsulated the tubercular débris at the base of the appendix, and that the repeated attacks of peritonitis were due to the escape of this material into the free peritoneal cavity. This also accounted for the hypersensitiveness and thickness of the pelvic peritoneum and, notwithstanding the severe infection of the pelvic peritoneum and the free fimbriated ends of the tubes, neither the fimbriæ nor the tubes were infected by the tuberculous process, supporting the results of the experiments on the monkey, showing that if the tubes are infected at all from the peritoneum there is some additional condition necessary, other than tuberculous peritonitis with free fimbriæ.

Postoperative Diagnosis.—Primary tuberculous appendicitis; perforation (repeated); tuberculous peritonitis. Convalescence uneventful.

Microscopic examination of the appendix revealed giant cells, epithelioid infiltration and tubercle bacilli; classic, tuberculous, perforative abscess of the appendix.

The experiments on the monkeys and this case show that tuberculosis can exist in the pelvic peritoneum without the tubes becoming tuberculous.

SYMPTOMS AND DIAGNOSIS.

In the acute cases, there is marked pain in the pelvis and lower abdomen, radiating toward the lumbar region; diarrhea (or constipation); nausea and vomiting. The local examination is painful; the vagina is hot; the cul-de-sac is filled; there is a general doughy feeling, but no appreciable tumor; there is little or no disturbance of the menstrual function. The temperature is elevated. According to Galvani of Athens, the fever is intermittent, especially elevated in the evening, with morning sweats.

In the chronic form, on the contrary, the temperature is frequently subnormal, 95.5 to 97 F. (Osler). Menstrual disturbances are very marked, pain is present at the menstrual epoch, the abdomen becomes enlarged

and tender, especially on palpation over the iliac fossæ. As the disease progresses, the patients become pale, anemic and emaciated. The abdomen is very prominent, due partly to distension of the intestines, with edema and thickening of its wall and partly to accumulation of fluid. Bouilly remarks that the abdomen does not present the usual characteristics of ascites, flat in the middle and enlarged at the sides. Instead, it resembles an ovarian cyst, projecting in front and depressed at the sides, hence erroneous diagnoses are very likely. Moreover, the quantity of fluid is not always the same, even the patients themselves notice the variations in size. The same author points out an important fact, namely, that the quantity of fluid present is no indication of the extent of the disease. As much as ten, twelve, or even more liters may be found in cases where the tuberculous lesions are limited to the adnexæ and true pelvis.

Lohlein, giving an account of his experience at the gynecologic clinic at Giessen, states that cases with easily recognizable ascites are most commonly found in the medical wards. The majority of his cases were sent in by the family physician with a diagnosis of tumor or ovarian cyst. He adds that the ascites is detected by palpation and by percussion, and will be found especially between the right and left hypogastric regions. In about one-half of his cases he found a distinctly flat sound from the median line to the left, even into the left iliac fossa. Toward the right, however, the sound gradually became higher in pitch. In cases also in which collections of fluid in the abdomen were walled off, the left side was distinctly duller than the right.

The explanation of this is found in the fact first pointed out by Thomayer that the diseased mesentery is drawn toward its root, hence pulling the bowels on the left to the median line and increasing the intestinal bulk on the right side, while the left side of the cavity

becomes filled with the fluid exudate. This explanation would not hold good in our cases, as the mesentery was so rarely infiltrated. Changes in the patient's position have little or no effect on the dullness.

Considerable information is afforded by rectal examination, and by the discovery of nodular masses and thickenings of the omentum.

Plaque-like thickenings of the deeper parts of the abdominal parietes are emphasized by Edebohls as a sign of the greatest value in the early diagnosis of peritoneal tuberculosis without ascites. "They impart to the examining fingers," he says, "the sensation as if the peritoneal surface were occupied by urticaria wheals of various sizes." He has met them varying in size from 1 to 8 centimeters in diameter. They may be quite numerous or but two or three found scattered over the anterior and lateral walls. By examination during the course of the operation, this author is satisfied that these plaques are due to hyperemia and swelling of the subperitoneal connective tissue. The peritoneum was frequently found unchanged, and not the seat of tubercles at the site of the induration. Indeed, the sign may be especially well marked in the very beginning of the disease, where only a few scattered tubercles are present. After the disease has progressed to universal and uniform thickening of the peritoneum, the sign will be less available. Edebohls therefore considers it of especial value in the very early stages, and when it can be clearly distinguished in parts of the abdominal wall not overlying a solid viscus, he regards it as almost, if not quite, pathognomonic. The only other disease, he continues, in which it might occur is disseminated secondary carcinosis. This, however, should present no difficulty, as it could only occur toward the end of carcinosis, while in tuberculosis it is an early manifestation.

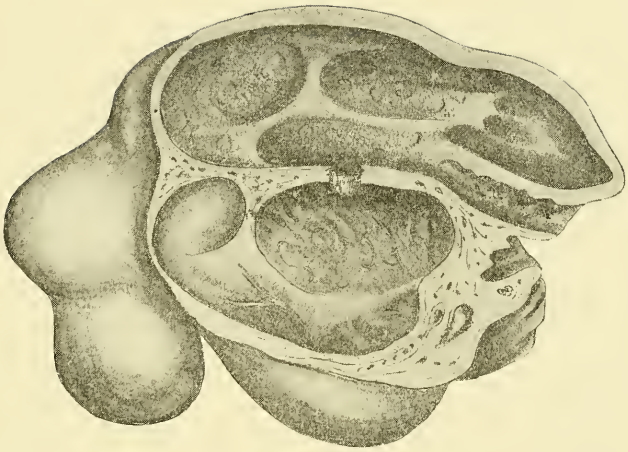
Edebohls believes enlargement of the spleen in connection with other symptoms is of some importance, as

he found it in one-half of his cases. He also noticed a deep brown discoloration of the entire integument, which is alluded to by Osler also, who tells us that in his case the adrenals were not affected.

The symptoms and physical signs in tuberculosis of the peritoneum vary greatly in the three distinct types of the disease.

1. *The Disseminated, Exudative, Non-Confluent, Serous Variety.*—In this variety, with involvement of the tubes, the attacks resemble recurrent peritonitis of appendiceal origin, except the field of activity of the process is the pelvis, and not the right iliac fossa; the attacks in this variety come with a pronounced periodicity, and not necessarily associated with menstruation; they are due to the periodic discharge of tubercular material from the tubes, as we demonstrated repeatedly in the operations during the attack. In this, the most common variety, the order of the symptoms is: 1, Mild temperature; 2, pain (principally in the pelvis), with nausea and vomiting; 3, local tenderness over lower half of abdomen; 4, great sensitiveness in the fornices; 5, induration of the tubes; 6, infiltration and thickening of the uterorectal fold, by procteal examination (this is of special significance, though it is also present in pelvic peritonitis, due to rupture of the appendix into the pelvic fossa); 7, temperature on second or third day (from 101 to 103 F.); 8, there is usually flatness in the lower portion of the abdomen and bulging of the cul-de-sac due to the effusion, the quantity of which varies from a few ounces to many gallons; 9, pronounced leucocytosis—in one the count was 18,400.

The peritoneum in these cases presents a congested surface, here and there gray fibrous plaques, fresh deposits of miliary tubercles most numerous near the mouth of the tubes are seen, and not infrequently fresh cheesy material is escaping or easily pressed out of the tuberculous tube. The attack is the peritoneal response



Tubo-ovarian abscess, tubercular.

or inflammation caused by the tubercular eruption or expulsion of débris from the tubes. In each recurrence the symptoms appear in about the same order and continue the same period of time, eight to fourteen days. The remission is not complete, as it is after an acute attack of appendicitis; there is continued hypersensitiveness of the pelvic peritoneum. The distinctly intermittent attacks do not occur in the nodular, ulcerative or perforative varieties, in the adhesive fibroplastic nor in the mixed infection types. The "doughy" condition of the abdominal wall is not present in this variety; the abdomen had the same fixed resistance as in other acute types of peritoneal infection. It requires considerable experience to make the differential diagnosis between this recurrent type of tubercular peritonitis and recurrent appendicitis, but when the patients are seen in the acute attack and the pictures are once clearly recognized there is less difficulty in making the differential diagnosis.

2. *The Nodular, Ulcerative or Perforative Variety.*—This may be described in words thus: The whole force or destruction of the process is concentrated into small areas, and in these areas not only the peritoneal coat, but the deeper structures, as the intestinal wall, the mesentery, uterus or ovaries, are destroyed or changed into caseous masses surrounded by dense connective tissue barriers and adhesions. The symptom-complex of this variety takes no definite form; the pains are irregular, there is no periodicity to the attacks, the fever usually does not exceed one or two degrees, there is a general malaise and occasional attacks of pain or cramps of an indefinite type, with local hypersensitiveness, and nodules or bands of increased resistance. When the adhesions occlude the intestine or impair the transmission of its contents, there may be recurrent attacks of colic which are not associated with temperature or manifestations of peritoneal inflammation. The circum-

scribed nodule, circumscribed sensitiveness or area of dulness are the only physical manifestations of the disease. The tubes are usually closed or fixed at their fimbriated ends to the neighboring viscera. The diagnosis in this class of cases can not be made definitely except by exploratory section.

3. *The Adhesive, Fibroplastic, Cystic, Circumscribed Abscess, Partition or Obliteration Variety.*—This variety of tuberculous peritonitis manifests itself in the destruction of the endothelial lining of the peritoneum and the production of connective tissue products of varying degrees of density from the soft, spider-like or fuzz-like agglutination projections from a non-glistening, edematous, inflamed peritoneum, to the firm, white, fibrous, inelastic, highly-organized tissue which has even a greater resistance than the peritoneum itself. In this process, circumscribed areas of the peritoneum retain their identity and react to the process in the production of a hypersecretion, producing the circumscribed cysts which are so characteristic of this type of the disease. Occasionally these cysts receive infective flora most likely from the intestine and produce circumscribed areas of suppuration. In this variety, too, we have the sealed ends of the tube or the fimbriated end communicating with a circumscribed cyst or pus accumulation. The intestinal wall and parietal peritoneum are usually very much thickened and inelastic, resembling wet leather. It is this pathologic change in the consistency and in the resistance of the intestinal wall and peritoneum that gives rise to the "doughy" response of the abdominal wall to external pressure. The adhesions may exist and obliterate the lower portion of the peritoneal cavity only, or the agglutination may extend and involve the entire peritoneum to the stomach, so that no free peritoneal cavity remains. (Veit points out that the fact of adhesions being very numerous and extensive in healing tuberculosis makes it probable that this form

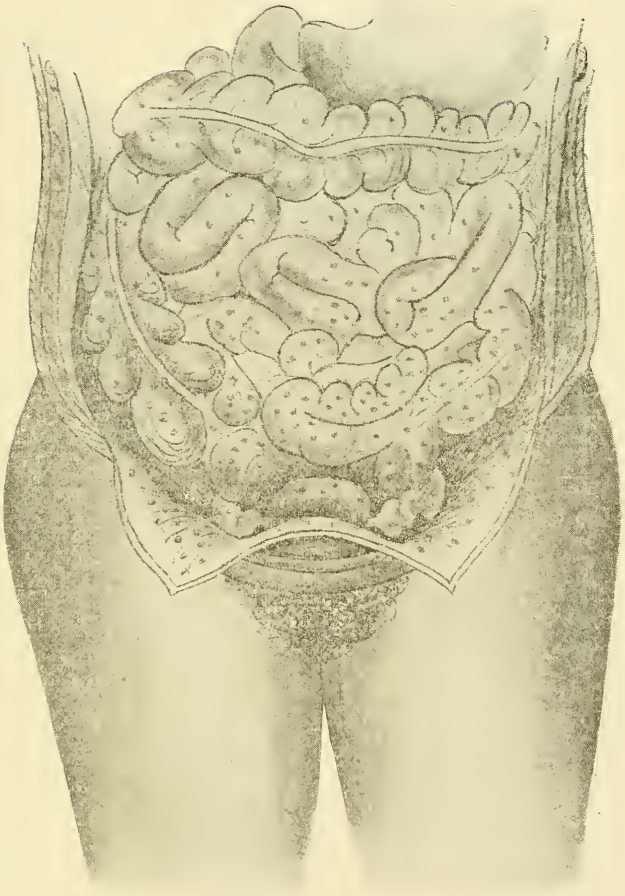
succeeds the ascitic form; however, he adds, it is seen in patients who have never presented any evidences of ascites.) The symptomatic manifestations of this type of disease are those of a continued inflammatory process with a minimum septic intoxication, i. e., the pain and hypersensitiveness of the peritoneum are continuous with exacerbations without an elevation of temperature above 101 F., except when circumscribed mixed infection occurs; then the night sweats and evening elevation of temperature become conspicuous symptoms. The leucocytosis is never pronounced; the emaciation is progressive, but not rapid. The physical signs are in consonance with the varied pathologic changes in the peritoneum above mentioned. In the cobweb variety we have slight vaulting of the abdominal wall, uniform decrease in the resonance of the percussion note, an absence of borborygmus and the classic "doughy" elasticity of the wall to pressure. The uterus is somewhat fixed; the fornices increased in resistance, but not infiltrated; the recto-uterine peritoneal fold is very sensitive to pressure, and the tubes are occasionally palpable as irregular nodular ropes.

In the circumscribed, cystic form the quantity of fluid in the cyst or cysts may represent but a few ounces, and rarely exceeds a pint. They are usually fixed, and are frequently mistaken, when deep in the pelvis, for cysts in the broad ligament. They are often irregular in outline, and occasionally involve a segment or even half of the abdominal cavity with a marked ridge or partition of adhesion extending obliquely or transversely across the peritoneal cavity.

The fluid does not change (position) its location with change of the body's position. The inflammatory reflex manifestations and mode of onset are not so pronounced as with torsion of the pedicle of an ovarian cyst. The clinical course, however, resembles that of combined tubal infection and ovarian cyst with peri-

cystic inflammation. In the latter pathogenesis we frequently have multiple inflammatory cysts resembling closely those of the tubercular variety, but the pathologic change in the peritoneum differs materially.

4. *Tubercular Peritonitis with Mixed Infection.*—While we class this as a separate variety, in reality it is any of the three preceding pathologic conditions to which the additional influence and effect of other infective flora have been added and in which the virulence of infection plays a very important rôle, both in the pathologic changes and symptomatic manifestations. When secondary mixed infection takes place, the tendency at once is to circumscription of the process. If at the time of secondary infection the tubes only are involved, the fimbriated ends immediately become closed or fixed to a neighboring structure or terminate in a circumscribed abscess. I have never seen a case of mixed infection of the tube with free fimbriated extremity, and only in very exceptional cases of the sero-exudative type have I found the end of the tube closed. So uniform is this condition that I consider that when the fimbriated end of the tube is sealed there is or has been a mixed infection. Occasionally we find a mixed infection in one tube, with its end closed, while the other tube has a simple tuberculosis with an ectropion of the mucosa and a free fimbriated end. In tuberculous mixed infection of the tube and small circumscribed abscess, we have exacerbations of the inflammatory process mimicing the exacerbations of specific pyosalpinx; the former has a more pronounced periodicity in manifestation and there is less inflammatory reaction of the peritoneum. The physical findings are practically the same. When a large tuberculous effusion or cyst receives a mixed infection and the lower half of the abdomen becomes similarly involved, we have an emphysema of the peritoneum with a distinct partition. In one case of this kind, the intestines were all displaced by a pathologic diaphragm that



Tuberculosis of peritoneum.

had formed on a level with the umbilicus and when opened was an enormous pyoperitoneum without intestines, as illustrated by the case of Mrs. L. (to follow). If the type of infection be virulent, these suppurations are associated with chills, pronounced elevation of temperature, hectic, diarrhea and rapid emaciation. The leucocytosis is not so marked as in the average acute peritonitis. The anamnesis and the physical and clinical manifestations before the inception of the mixed infection are of great value in making the differential diagnosis between this and others varieties of peritonitis.

There is occasionally a necrosis of the wall of the abscess, and the contents are emptied into the intestine, bladder, vagina, ureter or on the surface of the body. This adds materially to the gravity and the danger to the life of the patient. The mixed infection variety requires special consideration in its surgical management.

Mrs. L., aged 22. Admitted to Mercy Hospital July 6, 1896.

Family History.—Negative.

Personal History.—Has been married one year. As a girl weighed 140 pounds. One year ago had a slight attack of pleurisy. Does not know that there was effusion in the chest. No cough preceding nor following it.

About four months ago patient began to complain of lassitude and anorexia, with enlargement of the abdomen. There was no nausea nor vomiting. Shortly after the appearance of the enlargement she began to have fever with profuse sweatings; appetite became less and less; she had decided afternoon hectic. Case was pronounced typhoid fever.

When patient entered the hospital temperature was 102, pulse 136. Complains of dyspnea and pain through abdomen. This pain has been present to a mild degree for four weeks. Is relieved somewhat by bowel movements. Lungs negative.

Physical examination reveals a flatness over the lower abdomen from a level with the umbilicus. Fluid does not change with change in position.

Pelvic examination reveals thickening and fixation of the Douglas pouch; impaired mobility of the uterus; hypersensitiveness of the recto-uterine peritoneal fold; nodules in both fornices. The masses could not be outlined by bimanual palpation on account of fluid in the abdomen.

Operation.—July 7. Median incision. An enormous pyo-

peritoneum, filling the entire lower half of the abdomen to a level with the umbilicus. No intestines were to be seen in this field. The omentum was covered with thick fibrinous exudate, making a distinct diaphragm, walling off the upper from the lower portion. The tubes were buried in a mass of adhesions. The fimbriated ends were closed. Both were removed. The cavity was mopped out and iodoform gauze and tube drain inserted. Tube and gauze removed on fourth day.

After the operation the temperature dropped to 99 and remained there for three days and the pulse to 110. Then, gradually, the pulse and temperature began to rise and each evening the temperature reached 102, until the eleventh day, when it reached 103. The pulse gradually increased in frequency to 110-120. Patient left the hospital July 26 with the wound discharging, the hectic, anorexia, night sweats and emaciation continuing. The temperature increased to 104, and I learned that the patient died a few weeks after leaving the hospital.

I believe in this case, where the disease was so thoroughly circumscribed to the peritoneum, that if I followed the plan of the present time, namely, emptying and reclosing the abdomen, that the temperature would have remained down, as it did for the first three days, and that the patient would have continued to recovery. It was the secondary mixed infection, the result of the drainage, which I believe hastened the final unfavorable result.

PROGNOSIS.

The prognosis may be appropriately introduced with some quotations from the earlier writers:

Wunderlich (1856) did not observe a cure.

Bamberger (1864), who divided peritonitis into two classes: (1) Peritonitis from tuberculosis, and (2) that from the female genitalia, says that even when the local process is healed, death ultimately occurs from tuberculosis of other organs.

Bauer (1875) considered the condition absolutely fatal.

Jurgensen (1888) says recovery is rare and relative only.

Eichhorst (1891) believed the prognosis very bad. In his opinion, recovery is infrequent and even then is only relative and uncertain.

Strümpell (1892) believed the disease could progress to a fatal termination in a few weeks or months. Oc-

Shows tuberculosis of tubes with ends closed with abscess of ovary on left side.

casionally there is a pronounced remission of symptoms even to apparent cure. As a matter of fact, the disease reappears as an acute tuberculosis of other organs.

This type of remission was forcefully illustrated in the following case:

Miss H., aged 16. Seen in consultation April 9, 1901, suffering from a severe acute attack of tuberculous peritonitis, with considerable abdominal effusion, local nodules of excessive resistance and tenderness; infiltration and thickening of the pelvic peritoneum shown by practical examination; morning temperature 101, evening 103; sweats and hectic, great depression. These symptoms had been present with increasing severity for ten days. Operation was advised and declined. During the three weeks following the patient made great improvement; the vomiting ceased, the pain, temperature and effusion disappeared; the patient's general appearance was materially improved and the surgeon was severely criticised for suggesting the operation. Five weeks from the onset of the attack the patient began to complain of severe headache, nausea, and the temperature suddenly rose to 104. In twelve hours she was delirious and in seventeen unconscious. She remained in that state until she died, at the end of the third day, with all the manifestations of a tuberculous meningitis with effusion.

Vierordt (1894) reported a case of spontaneous cure as a curiosity.

Henoch (1897) says medical treatment is useless, and was not very sanguine as to operation.

Pribram (1898) mentions some spontaneous cures.

Kussmaul (1899) witnessed complete recovery in a case with enormous ascites, and several recoveries in cases of milder type.

In considering prognosis, the possibility of spontaneous cure must be taken into account. A cure so complete that not the least vestige of the original disease may be left. Several such are now recorded, Alterthum alone mentioning three. Veit looks on cases of peritonitis with ascites and granular dissemination over the peritoneum as undergoing healing. Gatti, in his experiments on animals, found that the fibrous form of tuberculosis healed readily, while the caseous

form never healed. As a general proposition, it may be stated that the more acute the case, the better the prognosis. The prognosis is materially influenced by the modern methods of aggressive surgery to which attention will now be directed.

TREATMENT.

The surgical or medical treatment of tuberculosis of the peritoneum involves four propositions: 1. To remove or shut off the source of supply to the peritoneum of new tubercular débris; 2, to remove the products of the infective process from the peritoneum; 3, to increase the tissue proliferation for the encapsulation of the foci already present, and, 4, to avoid mixed infection. All treatments that have availed, as recorded in the history of the therapeutics of this disease, have succeeded on these lines, as may readily be seen from the following abstracts:

Logically, says Gorovitz, treatment should fill two indications: 1, Cure the peritoneal lesion, and, 2, above all, suppress the tubal lesion, which was its starting point. The operative treatment dates back to 1862, when Spencer Wells made a laparotomy in a case of tuberculous peritonitis, and found, to his great astonishment, that his patient not only survived the operation, but was cured. Laparotomy was formally advised as a therapeutic measure by König, in 1884. Five years later, in 1889, this author was able to collect 131 cases from his own practice and from the literature. After a study of these, he announced that the most frequent method was a simple abdominal incision, with or without evacuation of the fluid.

The operation itself, as regards technic and dangers, is the same as a simple exploratory incision, according to Schwartz. It is done in three stages—opening the abdomen, under the most rigid asepsis, evacuation of the ascitic fluid and closure of the wound. The application of antiseptics, iodoform, etc., is of no additional

benefit, and the majority of operators advise tubular rather than gauze drainage. Care is necessary in incising the abdominal wall as the peritoneum is approached on account of the possibility of wounding the intestines which may be adherent to the wall.

The tendency of surgeons at present is to operate later and later, after the pain and discomfort from the ascites and adhesions have become so marked that relief is imperative. Too early intervention is unwise, since the tuberculous process may be still in process of evolution.

The operation by the vagina, advocated by Condamin and Lohlein and his pupils, is not in favor at present. The advantages claimed for it are: 1, The dangers of infection are reduced to the minimum; 2, there is no liability to a ventral hernia; 3, shock is lessened, owing to their being less occasion for handling the bowels, and, 3, recovery is quicker.

Baumgart, one of Lohlein's assistants, gives some figures which, while not extensive enough to afford any conclusive evidence, show there is but little difference between the abdominal and vaginal routes. Thus of 24 laparotomies, 11 healed (64.7 per cent.); of 7 vaginal operations, 4 healed (57.1 per cent.).

Healing has also occurred after simple puncture and after evacuation of the fluid and injection of air, advocated by Mosetig-Moorhof. Koster has had excellent results in tuberculosis of the anterior chamber of the eye by the puncture method. In one of Baumgart's cases, though, puncture was tried twice unsuccessfully; on one occasion 4,000 cubic centimeters were evacuated, and 6,400 on another. Laparotomy was finally performed on account of recurrence, and the patient was well five years afterward.

A second laparotomy may be called for, and in one case (that of D'Urso) no less than four were performed before healing eventuated.

To what is the beneficial effect of the operation to be attributed? There are several theories; the latest ones, and those in accord with the present knowledge of bacteriology, are as follows:

Gatti believes the cure is due to a post-operative serous effusion, an "aqueous" degeneration, so to speak, which has a bactericidal effect, dissolving the epithelioid cells and reviving the lymphocytes.

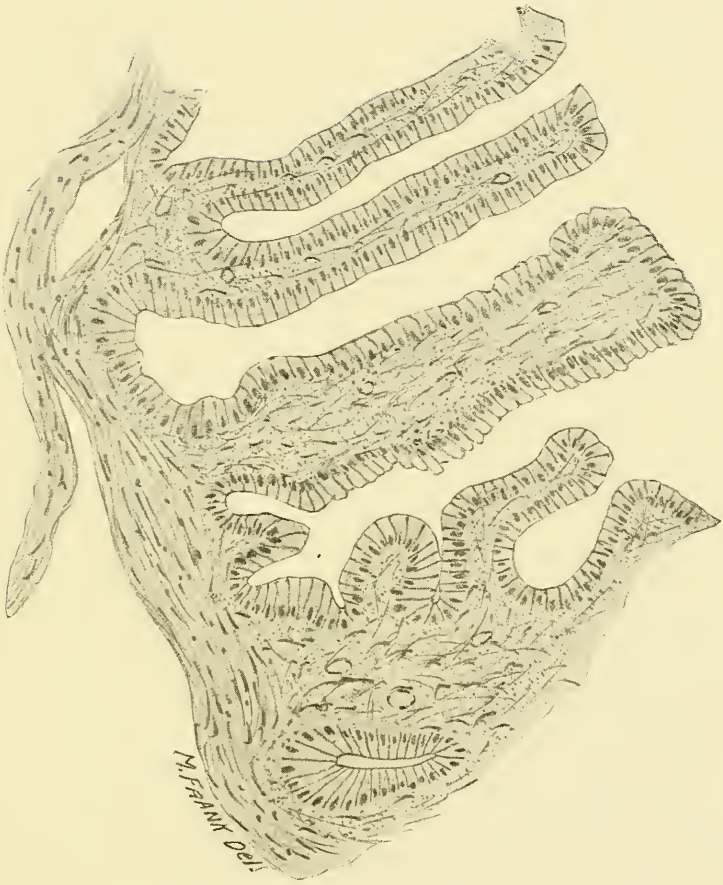
Hildebrandt's opinion is very similar; he considers the cure to be caused by a marked post-operative hyperemia.

Nannotti and Bacchiocci, from their experimental work, also conclude healing arises from the inflammatory reaction of the peritoneum with increase in the resorptive powers of the serosa and consequent fibrous degeneration of the tubercles.

Von Wickel claims the laparotomy heals by evacuating a toxic principle.

Veit amends this by adding that it has a still more important effect—to determine the arrival of a new quantity of antitoxin. If, he says, we evacuate the effused fluid suddenly and completely, a new effusion of normal serum occurs immediately, which is possessed of bactericidal power in the highest degree. Hence the struggle against the microbes will have the best chance of succeeding. If, however, fresh bacilli continue to penetrate into the peritoneum, or a tuberculous focus elsewhere in the body partly neutralizes this antitoxic power of the serum, it is evident healing will not result.

To the objection that the antitoxin serum should annihilate the bacilli in all tuberculous foci, Veit makes the following answer: The presence of bacteria in the tissues produces an antitoxin in the serum which acts on all bacteria that enter the body after its production. Those bacteria, however, which were the cause of its production are not affected; they are either protected by their toxins or are surrounded by a neutral zone, through which the antitoxin can not act. Failures to



Section of normal fallopian tube of monkey.

cure in the early stages by a premature operation are due, says Veit, to the fact that the serum has not acquired sufficient antitoxic power. These considerations of Veit are corroborated by Arcangeli, who found that the older the fluid, the more pronounced its antitoxic power.

We now come to the question of vital importance: In what proportion of cases of tuberculous peritonitis may we expect a cure after operation?

As it might be expected, from the authors quoted in the section on prognosis, some observers prefer medicinal treatment. Hildebrandt, for example, claims that laparotomy only encourages the tendency of the tubercles to heal, but is incapable of causing this by itself. The advocates of medicinal measures advise early systemic treatment as soon as the diagnosis is established and rely on the usual anti-tuberculous remedies—rest, exhibition of creosote, iodin, and the like.

The most recent advocate of conservative treatment is Borchgrevink, who gives us his experience in two almost equal series of cases, one with laparotomy, the other without. Of 22 cases operated on, 14 (63.6 per cent.) recovered, and 8 died. Of 17 cases treated conservatively, 14 recovered (82.3 per cent.). As a result of his observations, Borchgrevink concludes that though the operation may have done good, it was doubtful, to say the least.

Against these conservative opinions is the overwhelming evidence of numerous operators, and the value of operative intervention can no longer be said to be in question. A distinction must be made, however, between anatomic healing and clinical healing. The former is possible, but apparently unusual. As regards clinical healing, it is evidently unfair to report "cures" a few weeks or months after the operation. As in carcinoma, a time limit must be set, and Von Winckel sets this at 5 years, which is evidently too long a period.

A number of collections of statistics have been published, showing the beneficial effects of the operation; among these may be cited:

Margarucci: 250 laparotomies in Italy, with 85 per cent. recoveries.

Von Krencki: 266 laparotomies. Of the ascitic cases, 71.5 per cent. recovered; of the adhesive, 61.6 per cent., and of the encysted, 75 per cent.

Thomas: 346 laparotomies. Of the ascitic variety, 73 per cent. recovered; of the encysted, 57 per cent., and of the dry adhesive, 57 per cent. likewise.

Roersch: 358 laparotomies, with 70 per cent. of recoveries.

Adossides: 405 laparotomies, with 75 per cent. of recoveries.

Hall (Dr. Rufus B., of Cincinnati) reports 110 sections for tuberculosis of the peritoneum; 4 were in the male: all from tuberculosis of the appendix; 106 on females, 8 due to tuberculosis of the appendix and 94 to other causes. Of these, 94 are symptomatically well; one died the third day following the operation; 6 died of tuberculosis in from 14 months to 3 years after the operation; one died 3½ years after the operation, and another, 4½ years after. Two cases have now advanced pulmonary tuberculosis and will probably die. These are striking results in favor of operative treatment.

The figures from the Königsberg klinik give 58.8 per cent. of recoveries, and Frank, from observations at the Heidelberg klinik, places the percentage of recoveries at from 40 to 50.

While a rapid recurrence of the ascites is an unfavorable prognostic omen, a second laparotomy has been done in over 70 cases, and in one, as stated before, 4 times.

In this connection, Sippel's case is both interesting and instructive. At a laparotomy, the abdominal end

of the tube and the peritoneum were found to be studded with tubercles. Healing apparently resulted, yet seven months later pain reappeared on the left side and a second laparotomy disclosed the same condition of affairs on this side, the first focus on the right side having healed completely.

TREATMENT OF TUBERCULAR PERITONITIS.

From the comments by the various writers it is clearly recognized that there is a wide divergence of opinion as to the results obtained by medical and surgical intervention and by varieties of these. This difference of opinion, evidently based on results of accurate observations and founded on facts, is due to the lack of classification or recognition of the different pathologic processes that have taken place or are taking place in the peritoneum. A few of the writers have based the statistics of their results on clearly-classified pathologic conditions of the peritoneum, and these statistics are of the greatest value. No general surgeon would expect a restoration of the knee joint, *ad integram,* where the cartilage and synovial membrane had been destroyed, no matter whether the treatment was a local application, a dose of creosote, a powdering with iodoform, an exposure to air or to the *x*-ray. And still, with exactly the same degree of destruction of the peritoneum, patients are expected to recover by any of the varieties of treatment mentioned.

In discussing the proposition of prognosis or results by any type of treatment, a distinct classification of the pathologic conditions must be mentioned, if the author's opinion or statistics are to carry weight. The treatments must be varied to meet indications for overcoming the pathologic conditions in the individual case. In expressing ourselves on the subject of treatment, we shall endeavor to keep clearly in mind the four prime and typical pathologic conditions described above, notwithstanding we recognize that these often merge and

the treatment must be adapted to the predominating pathologic phenomenon.

I. TREATMENT OF THE DISSEMINATED, SEROUS VARIETY.

The treatment of disseminated miliary, exudative, non-confluent, serous peritonitis which, in the great majority of cases, is associated with or due to tuberculosis of the tube: The fimbriated end of the tube is open; it is constantly ejecting into the peritoneum the tubercular débris and adding additional insult to the peritoneal surface. The medical treatment of this class gives poor results, as in thousands of laparotomies it is the rarest exception to find a healed tuberculosis of the peritoneum where a mixed infection and closure of the tube has not occurred. Furthermore, it is a well-recognized pathologic fact that tuberculosis of the mucous surface of the tube, like tuberculosis of the mucous surface of the intestine, has little tendency to heal or encapsulate, and without the healing of the mucous membrane of the tube there is no cure of the peritoneal disease as long as the fimbriated end remains patulous. Abdominal section *per se* without the removal of the tubes and without the induction of an inflammatory process, which would produce the occlusion of the tubes, would be as futile and useless as internal medication or creosote. The prime indication in this class of cases is to remove the diseased tubes on the uterine side of its primary caseous nodule, which is usually about five-eighths of an inch from the uterine cornu. When this is accomplished and the abdomen closed, if there be no pus infection, the case will recover whether it be drained, iodoformed, solarized or simply closed up without any of the so-called life-saving touches. I am convinced, from the observation of the process of repair of tuberculosis, not alone in the peritoneum, that it is important to have an inflammatory reaction following laparotomy if the case is to make a rapid and satisfactory recovery. This post-section reaction, I believe,

is due to a fermentation or decomposition of the fluid or secretion remaining within the abdomen. This does not, to my mind, produce an antitoxin which destroys the bacilli, but it causes what this iodoform formalin emulsion injection into the knee joint causes—a chemical irritation and inflammatory reaction in the tissue. If the peritoneum be inspected three or four days after the laparotomy, as I have had opportunity to do on more than one occasion, it will be found intensely congested, its vascularity greatly increased, its gloss almost or quite abolished and the fluid not fresh, clear serum, but cloudy or seropurulent, showing the most active proliferation. It is this tissue proliferation which overwhelms and encapsulates the tubercular foci on the surface of the peritoneum. Fluids removed at this stage showed equal or greater toxicity than fluids removed preceding the operation, but the resistance of the tissue as manifested in the so-called inflammatory reaction was increased sufficiently to overcome the destructive effect of the micro-organisms, i. e., the inflammation is not the disease, but the manifestation of resistance offered by the tissues to the invading pathogenic flora. The phenomena of inflammation are the outward manifestations of tissue resistance, are life-saving, and should be encouraged, except when the local leucocytosis, edema and proliferation are such as to strangle or occlude the circulation. Celiotomy attains its best results in this class of cases. If the focus of supply to the peritoneum be a mesenteric gland, a peri-appendical tuberculosis, the removal of the focus is indicated the same as removal of a tube. Should the communication between the peritoneum and the focus be destroyed, then the laparotomy will produce a cure of the peritoneal conditions the same as if the focus is removed. But, with the source of supply cut off, the tendency to repair of the peritoneum is great, even without laparotomy, and in this class of cases internal medication or expectant

treatment avails. When there is tuberculosis of the intestine and the peritoneum is involved without extensive adhesions, the indication is to remove the tuberculous intestine, unless the area be too great. If its removal be impracticable, the infected area should be excluded from the fecal current by short-circuiting the intestine. The tuberculous process in the excluded portion ceases to advance and often heals. The patient's life can be prolonged and he can also be relieved of most of the disagreeable symptoms of his tuberculosis. Resection of the bowel for tuberculosis in the presence of a peritoneal tuberculosis is a very hazardous and, usually, futile undertaking, as an intestinal fistula is often produced when the patient survives the operation.

II. TREATMENT OF THE NODULAR, ULCERATIVE AND PERFORATIVE VARIETIES.

In this variety, based on the clinical history and physical findings, as well as the biopsies, the changes, in a large proportion of the cases, are as follows: First, a more or less diffuse tuberculous peritonitis, usually of tubal origin, but due to enteric and glandular infection more frequently than the previous variety; second, the healing of the peritoneum except in circumscribed areas, as at the ends of the tubes, between firmly agglutinated intestinal coils and between the omentum and parietes. In these circumstances the tuberculous process destroys the peritoneum and occasionally the intestinal wall, tube, etc., and produces a considerable sized caseous mass. These masses are usually surrounded by firm connective tissue barriers, and unless they occlude the lumen of the bowel or perforate one of the hollow viscera, they give the patient very little inconvenience. There is commonly a considerable quantity of fluid in the peritoneal cavity, but the exacerbations and recurrences of the peritonitis are less frequent and mild, so that they are many times overlooked and the peritonitis is not even suspected until, on physical exam-

ination to ascertain the cause of the emaciation, night sweats, etc., the tubercular nodules are recognized in the abdomen. If the nodules are few and the peritoneum practically free from adhesions, good results are obtained by operative procedure. The tubes, in these cases, should be removed if it can be accomplished without lacerating the intestinal wall. The circumscribed accumulation of tubercular material should not be disturbed, and the greatest care should be exercised not to injure the intestinal wall or hazard its integrity and so produce an intestinal fistula. If the tuberculosis is confined to a few adjacent coils of the intestine and the remaining portion of the peritoneum free from adhesions, the coil should be resected, otherwise the infected area should be excluded and allowed to remain. Should there be entero-intestinal fistula, as is common in this variety unless the peritoneum is comparatively free from tuberculosis, the resection should not be made, as failure of union is not uncommon and intestinal fistula results. It is in this class of cases that the intestine is often incised in opening the abdominal wall. It is here also that the limitations of surgical interference should be kept clearly in mind and when the greatest discretion should be exercised in the separation of adhesions, having in mind that these adhesions are Nature's cofferdams and are often life-saving. It is questionable whether surgery gives better results than internal medication in this class of cases. It does clear up the diagnosis and, with proper discretion, adds nothing to the danger.

III. TREATMENT OF THE ADHESIVE VARIETY.

The classification of cases occurring as adhesive, fibroplastic, cystic, partition, and obliteration of cavity is explanatory of the pathologic changes. It signifies, first, that the process is severe in that it destroys at least the epithelial layer of the peritoneum, and, second, that the membrane has finally reacted to the production of

firm encapsulating and reparative cicatrization. In the milder types of this variety, the entire surface of the peritoneum or circumscribed areas is gummed together with a web-like, mucilaginous substance which is easily separated and when separated does not leave an abraided or oozing surface. If the process has been more destructive, the union is organized connective tissue, and when separated leaves a bleeding, denuded surface; indeed, if the walls of the viscera do not tear in the efforts at separating adhesions, so extensive may this process be that the peritoneal cavity, as such, is obliterated. Surgery is of no avail in this class and the intestine is in great danger of injury in opening the abdomen. Circumscribed cysts form between the intestinal coils and in the pelvis usually; they are usually small, holding but a few ounces; occasionally they contain quarts and are surrounded by agglutinated intestines and parietal peritoneum. These are to be opened and not drained; the walls can not be removed, and their removal should not be attempted. The surface should be dusted with iodoform or sponged with a 1/1000 formalin solution, remembering that this sac is not peritoneum, as a rule, but a cyst wall of inflammatory origin. These cavities should never be drained, as they are easily infected, and once infected, they continue as suppurating sinuses for months, often associated with pronounced symptoms of septic absorption, taking on the characters and dangers of the pathologic varieties to be described under the fourth classification.

These circumscribed cysts are often mistaken for ovarian or broad ligament cysts, and when efforts are made to remove the cyst walls, the result is baneful to the patient and humiliating to the operator. The greatest care should be taken not to infect them when operating, and the abdomen should be securely closed. After evacuation and irritation, the cavity is obliterated by adhesive inflammation.

Transverse section through uterus of monkey, showing tubercular process.

IV. TREATMENT OF MIXED INFECTION, CIRCUMSCRIBED ABSCESS AND GENERAL SUPPURATION.

Pus infection may occur with any of the preceding varieties, or it may be one of mixed infection from the primary focus of tuberculosis and extension from there to the peritoneum. When the primary focus is a mixed infection, the abscess is always small, and its extension is by ulceration, coagulation, necrosis and other than extension along the surface or through the lymphatics. If the primary focus is the tube, and this is of the mixed infection variety, the end of the tube becomes sealed and a pyotuberculous salpingitis is established. The extension may be an ulceration through the fimbriated end and the formation of a circumscribed abscess in the cul-de-sac, ovary, or wherever the fimbriated end is adherent. The extensions from the mixed infection salpingitis are usually by ulceration through its wall to the neighboring tissues; if the tube be adherent to the ovary, a tubercular abscess in one of the graafian follicles to which it is attached is formed, as shown in the case of Miss N., reported above. If it adheres to the intestine it may perforate its wall to a tubo-intestinal-sinus result.

This is one of the conditions to be apprehended in operating for tuberculosis of the tubes and peritoneum and is one of the most dangerous, as fistulæ of the intestine, of tubercular origin, are difficult to suture on account of the infiltration of their margin and neighborhood. Resection is next to impossible on account of the extensive adhesions; also the peritoneum, which is of such great importance in all types of intestinal approximation, has been destroyed by the tuberculous process and, therefore, no primary peritoneal adhesions form to support the walls. In repairing these openings, extensive surface approximation should be secured and a number of rows of sutures inserted, that apposition may be insured during the process of tissue regeneration.

When the perforation is in the first portion of the

rectum, and that viscus fixed, I have, in two separate cases, successfully sutured the fundus of the uterus into the opening and secured a primary closure.

As agglutination and union of tissue is slow under these circumstances, intra-intestinal pressure should be reduced to a minimum by the use of a permanent rectal tube; or, if the opening be larger, a temporary colostomy should be performed until the perforation is closed. The large pus and tubercular accummulations in the peritoneal cavity are, as a rule, due to formation of circumscribed tubercular cysts, and those cysts have a secondary pus infection, producing the large mixed infection tubercular abscess. These may range from the size of a walnut to an accumulation occupying the lower half of the peritoneal cavity. In one of my cases there were no intestines except the descending colon and rectum below the umbilicus, a firm diaphragm of adhesions having formed across the abdomen at the umbilical level. The peritoneum above this diaphragm was free from tuberculosis; below the diaphragm was one large empyema of the peritoneum. After opening and draining, this wall was so dense and firm that there was very little contraction and the patient succumbed to the toxemia of the mixed infection. The case should have been closed after the exploration and repeatedly aspirated and injected with a solution of glycerin, 88 per cent.; iodoform, 10 per cent.; formalin, 2 per cent. In the more acute and virulent mixed infections, where a general tuberculous peritonitis has preceded, the intestines and omentum and abdominal wall become adherent in all varieties of ways, so that innumerable, circumscribed, non-communicating, suppurating pockets fill the abdominal cavity. These cases are practically hopeless; one, two, ten or innumerable abscesses may be overlooked; following the operative separation of the adhesions there is additional absorption and the patient's life is rather shortened than prolonged by the operative

interference. Cases of this class can often be diagnosticated without section, as they present nodular, fluctuating or semi-fluctuating masses in the abdomen without assuming the general shape of the cystic neoplasms resulting from the ovary, kidney or omentum. Here exploratory puncture with a very fine needle is advisable and is one of the rare exceptions to the general rule against exploratory punctures of intra-abdominal enlargements.

In the mildest types of mixed infection, the general peritoneal cavity is filled with a seropurulent effusion without limiting adhesions and without the destruction of the peritoneal endothelium. These cases are as favorable for evacuation and primary closure as the purely serous variety. They should never be drained, and if the cavity refills it should be aspirated. The greatest caution in instrumentation and sponging should be taken, lest a more virulent inoculation be established in the susceptible culture medium.

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